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BULLETIN 7

HANDBOOK OF NEBRASKA TREES

A GUIDE TO THE NATIVE AND MOST IMPORTANT
INTRODUCED SPECIES

BY

RAYMOND J. POOL

Professor of Botany

THE UNIVERSITY OF NEBRASKA

CONTRIBUTION FROM

THE BOTANICAL SURVEY OF NEBRASKA

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HANDBOOK OF NEBRASKA TREES

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RAYMOND J. POOL

INTRODUCTION

Nebraska could not be classified as a forested state, since less than 3 per cent. of the area of the state is covered by natural timber. However our native forest trees are quite numerous as to different kinds and their distribution in the state is characterized by many interesting facts. The every day life of our people is not so commonly associated with trees as is that of peoples in the more wooded states where lumbering and the wood-working industries are very important occupations because of the proximity of great forests of coniferous or broadleaved trees. The people of Nebraska use the wood produced by certain native or introduced trees for fuel, fence posts, poles, and in some cases it is even sawed into lumber. Trees are also very widely used for shelter-belts or wind-breaks and for planting along the roadside or street and for beautifying our premises. The extremes of climatic variations which frequently become more or less uncomfortable in either winter or summer are considerably ameliorated by the presence of trees about our homes and farms. The thousands of fine, planted groves dotted over this state have done much to make our broad prairies more inhabitable as well as more beautiful. So in various ways the people of Nebraska are brought into a more or less intimate association with trees and many become greatly interested in knowing the different kinds of trees that add so much to the joy as well as the profit of living.

Botanists have studied the trees of Nebraska for many years so that our trees are well known to that class of citizens. Considerable has also been written about Nebraska trees, but a simple and well illustrated guide which would enable anyone to identify our trees and to become better acquainted with them has never before been published. The chief purpose of this little book is to offer a ready and direct means for the identification of our native and commoner introduced trees and to supply information about the same of the kind which is being continually requested of the department of botany.

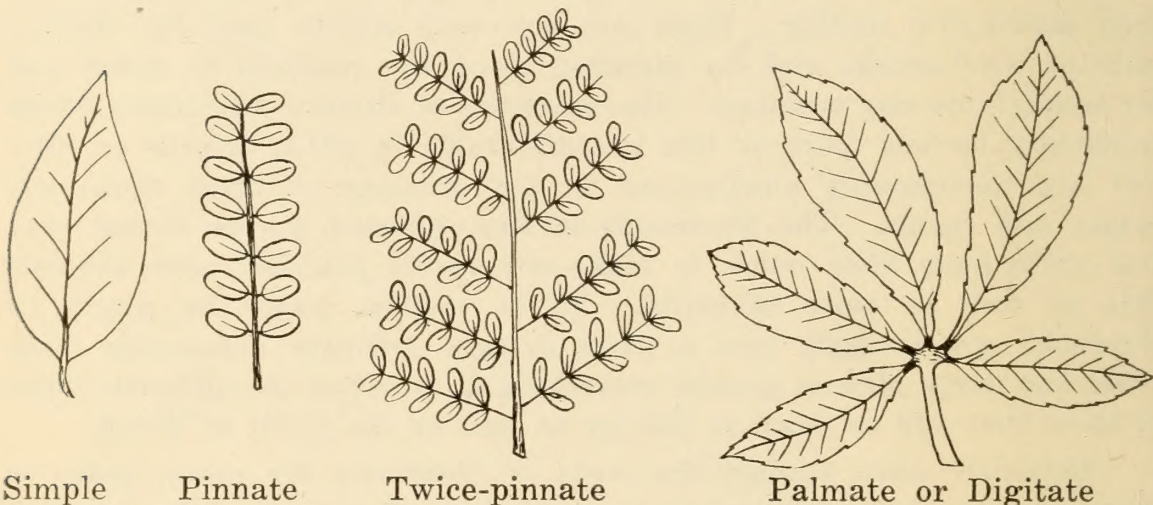
I am pleased to render grateful acknowledgment in this place of the kindness of Professor Chas. H. Otis, of Western Reserve University, Cleveland, Ohio, formerly of the University of Michigan, who loaned me the original pen and ink drawings from which the greater number of the figures with which this book is illustrated were prepared. These drawings were originally made by Professor Otis to

illustrate his book entitled, "Michigan Trees", which was published by the University of Michigan in 1913. The state of Nebraska and the author of this handbook greatly appreciate the privilege of using these figures in a publication on Nebraska trees. The author is keenly aware of the fact that this handbook would have been impossible at the present time had Professor Otis not consented to loan his excellent sketches. Professor T. J. Fitzpatrick, Curator of the Herbarium, of the University of Nebraska, has also rendered valuable assistance in the reading of manuscript and proof and in suggestions with reference to various other data.

THE NAMES OF TREES

The first question asked about a tree is about the name of the tree. This is in simple recognition of the great principle of systematic biology that we must have names for the organisms about which we talk or write. Now there is a fundamental, or at least a practical, difference between the names of plants and the names of people. We have a

I. Forms of Leaves

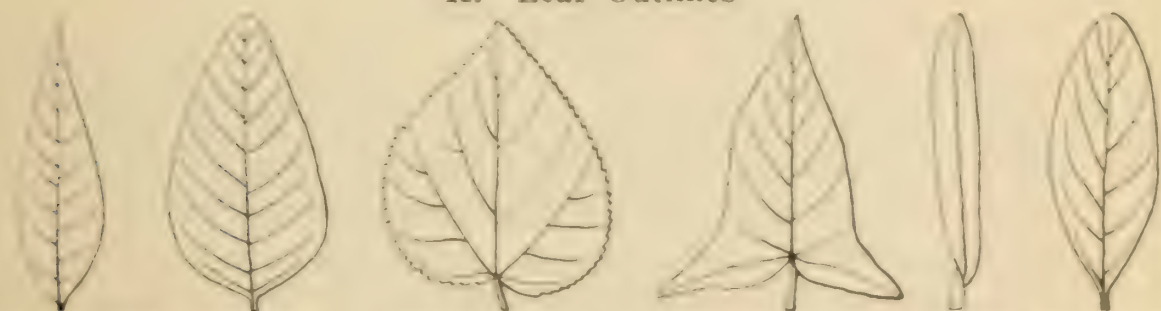


name for each individual human being, but not so for trees and other plants. Imagine a farmer having a name for each of the thousands of plants in his wheat field or a woodsman having a name for each individual tree in his forest! The name of a given kind of plant covers all of the individuals of that particular kind. All of the wheat plants in the farmer's field have the same name, i. e. *Triticum vulgare*, and all of the white pine trees in the Michigan woodsman's forest have the same name, *Pinus strobus*. Of course there are different *kinds* of wheat and also different *kinds* of pines. All human beings have the same name in this same sense, and that name is *Homo sapiens*. This is the biological or scientific name for the human animal, so, after all, the names of men and the names of trees are alike in their biological application. But for numerous obvious reasons we have applied a name to each human being and have forgotten the real or biological name.

Each kind of plant and animal has a name composed of two words as indicated in the above paragraph. The first name, always spelled with a capital letter, is the generic name or the genus, the last name, always spelled with a small letter, is called the specific name or the species. The plural of genus is genera; species is both singular and plural. Besides these real names for our trees and other plants there are also the abominable "common" names which may be in English, French, Latin, German, Russian, Chinese, Choctaw, etc., which are very misleading as to the real identity of the plant in question. Scientific names are always Latin names, regardless of the language which the speaker or writer may use. This is tremendously advantageous because a given plant may have scores of common names in various languages but only one scientific name which is the same for all languages.

The objection has been raised against scientific names that they are long, meaningless, difficult to pronounce and to learn, and in general that they represent a bad principle. Such objections really have no foundation or weight because few English speaking people seriously object to saying *Chrysanthemum*, *Ageratum*, *Sequoia*, *Geranium*, *Mag-*

II. Leaf Outlines



Lanceolate Ovate Heart-shaped Halberd-shaped Linear Elliptical

nolia, etc., and all of these are scientific names. Of course some persons would rather memorize an outlandish and meaningless name for a plant and then quarrel with a friend who has a different "common" name for the same plant as to the identity of the plant in question,



Oblong Oval Orbicular Oblanceolate Spatulate Obovate

rather than to think of accepting a good scientific name. Such people seldom know plants anyhow; such an attitude will not lead a person into scientific habits of thinking and living, habits which are coming to be more widely lauded and practiced each year. So why not say:

Tilia for "Basswood", *Pinus* for "Pine", *Rosa* for "Rose", *Fragaria* for "Strawberry", *Castanea* for "Chestnut", and *Falcata* for "Hog Pea-nut", etc.?

It is understood in the classification of plants that *genera* are groups of *species*, and that *genera* in turn constitute *families*, while *families* are grouped into *orders*, *orders* into *classes*, and finally a series of *classes* constitutes a phylum. Phyla are the principal groups of the plant world, such as those including the ferns, the mosses, the pond scums, and the flowering plants. This system for the classification of plants has been found possible because botanists have discovered relationships among plants, and these different groups are employed to indicate the degree of such relationships. So I have given the scientific names of all of the trees discussed in this little book and have also indicated the families to which the various species belong. The family name of a plant can be told by the ending of the word, *-aceae*, as *Rosaceae*, the rose family, or *Pinaceae*, the pine family. I have also given a "common" name or two for each species, but the uncertainty and often the utter meaninglessness of such names must be understood.

NUMBER OF NEBRASKA TREES

There are approximately sixty different species of native trees in Nebraska. We cannot say exactly how many there are because it is often difficult to decide as to whether a given woody plant is a tree or a shrub, unless we adopt some rigid, arbitrary definition for these two types of growth, and even then we would experience some uncertainties. Some botanists would place certain species in one group and others would probably place the same species in the other group. However, there are about sixty species of woody plants growing naturally in this state which most botanists would readily class as trees.

Certain woody plants which occasionally develop into the form of large shrubs or small trees, and therefore might possibly be included in our list of trees are as follows:

Acer glabrum, Mountain Maple.

Cornus candidissima, Cornel or Dogwood.

Euonymus atropurpureus, Burning-bush or Wahoo.

Lepargyrea argentea, Buffalo Berry.

Prunus melanocarpa, Choke-cherry.

Rhamnus caroliniana, Indian Cherry.

Rhamnus lanceolata, Common Buckthorn.

Rhus copallina, Sumac.

Rhus glabra, Smooth Sumac.

Salix bebbiana, Bebb's Willow.

Salix lucida, Shining Willow.

Salix missouriensis, Diamond Willow.

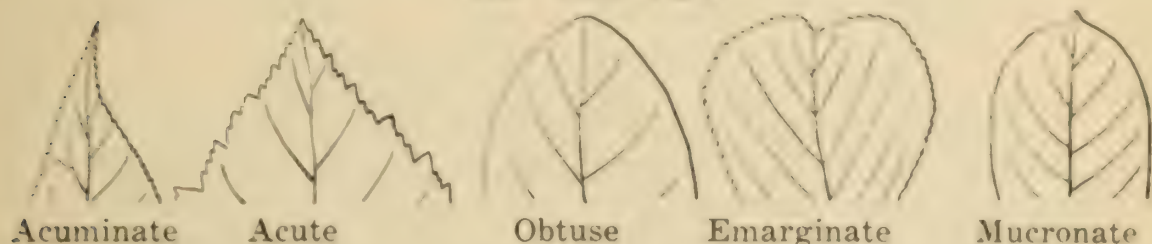
Some of these species have been included in former lists or papers on the trees of Nebraska.

I have also included a number of exotic or introduced species in my descriptions. Some of these are very commonly planted in many parts of the state and people are interested in them as they are in our native trees.

SOURCES OF OUR NATIVE TREES

A study of the origin of the flora of a given area is one of the most interesting phases of plant geography for the amateur. Nebraska occupies a unique position with reference to the great forests of North America. The eastern portion of the state lies in the lower Missouri valley where the tree growth is composed of broadleaved species like those

III. Leaf Tips



of eastern United States, while the western end of the state lies within the floral influence of the Rocky Mountains and its forests of broadleaved and coniferous trees which are quite different from those of the east. The trees of the east have migrated westward and the trees of the Rocky Mountain region have come eastward, and we find that many such species reach the extreme outer limits of their natural distribution in our state.

The western yellow pine and the narrow-leaf cottonwood are very common trees in the Rockies that have migrated eastward and have entered western and northern Nebraska. The greater number of our native trees, on the other hand, have entered the state from the east and south via the Missouri river and its tributaries from the eastern forests especially as they are represented in the Ohio valley. The black walnut of the east meets and mingles with the western yellow pine from the west in northern Nebraska in the vicinity of Valentine.

Many eastern species have barely entered our state on their journey westward and are to be found only in the extreme southeastern corner. This fact is notably illustrated by the oaks and the hickories. Other species have come farther into the state where they have, in general, followed the stream courses quite closely. Besides these trees there are many other species which occur in Iowa and Missouri which have not yet reached Nebraska. And, of course, there are many trees in Ohio and Kentucky which have not come as far west as Iowa and Missouri.

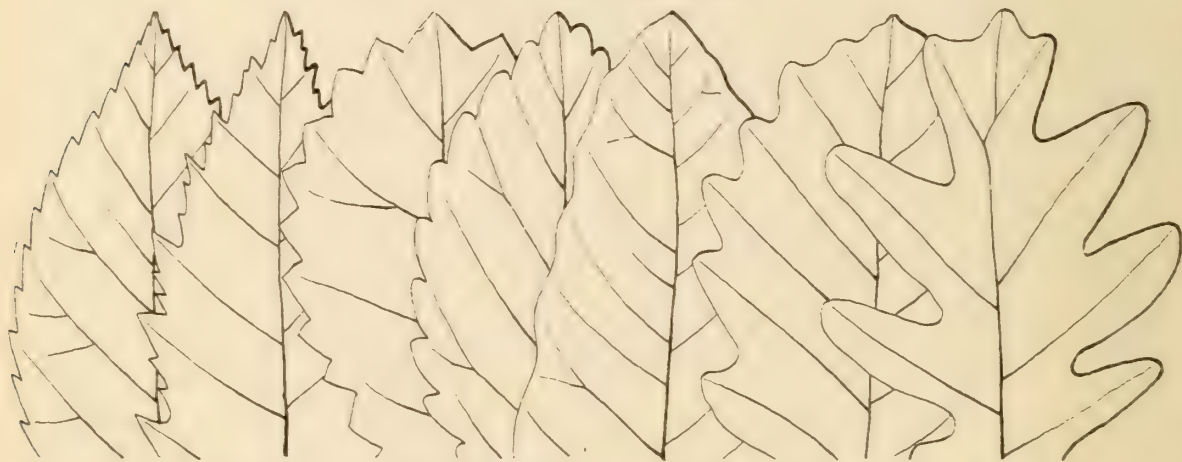
These facts serve to illustrate the idea that the frontiers of two very widely separated forest regions lie within the borders of our state. What is true of the trees in this regard is also strikingly illustrated by the distribution of our native shrubs and by the herbaceous flora of the state as well. The outline maps in the back of the booklet will show these facts graphically in so far as our native trees are concerned.

These distributional maps will be of interest also in showing the portions of the state in which certain trees may probably be found. The maps are very general, because of their small size, but they have been prepared from all of the available data in the possession of the Botanical Survey of Nebraska, and it is hoped that they will stimulate the local investigation of our native trees. Not quite all of our native species are included in the maps, but the range of the missing ones may be learned by consulting the description of those species in the body of the book.

THE PURPOSE AND PLAN OF THE HANDBOOK

The primary purpose of this handbook is to enable the people of this state to identify our native trees and the common introduced species of trees as well. The descriptions have been written in as simple and untechnical language as possible and practically all technical terms commonly employed in such works have been omitted, or the essential

IV. Leaf Margins



Serrate Doubly serrate Dentate Crenate Undulate Sinuate Lobed

meanings of such terms have been rendered into more common terms.

The only semi-technical terms used are in connection with the descriptions of the leaves and flowers. It is taken for granted that the average person understands the common parts of a flower and is able to recognize those structures at sight. Sepals, petals, stamens and pistils (or ovaries) as the regular organs of flowers should be understood by everyone, and so a detailed discussion of these things in this popular work is not necessary. Most of the trees may be identified without the flowers anyhow, which in all but a few cases are present

but a very short time. The leaves, however, are present for a longer period and so are very useful, even to the beginner, in the identification of trees. Leaves vary greatly in size, shape, color, size, surface characteristics, general appearance, etc., but those of each species are fairly constant within certain limits for the particular species in question. Because of the great value of leaves for purposes of identification I have included in these preliminary pages a number of outline sketches which may aid in the interpretation of the various leaf characteristics as they are mentioned in the descriptions. The characteristics of buds, in so far as they are concerned with shape, may also be readily understood by thinking of a vertical section of the bud in terms of leaf outlines.

The preliminary keys are for the purpose of enabling a person to locate a given unknown tree more readily than would be possible over the different illustrations. The key is designed to facilitate the location of or the "unlocking" of information about trees by first directing the student to the names of the various trees. Keys are usually based upon the most striking or contrasting similarities and differences which the various trees exhibit, and are arranged so that these characteristics stand out in bold, co-ordinate contrast as series of two or more alternatives. Such contrasts as "leaves simple" and "leaves compound" or "buds smooth" and "buds hairy" will serve to illustrate the construction of the key. The practical use of the keys depends upon the following through with the various alternatives and subdivisions of the key, as one has the specimens of a tree before him, until he is able to reach one of the names at the extreme right hand margin, then turn to the page indicated.

Corrections or suggestions in connection with any of the data included in this handbook will be thankfully received by the author. He will also be pleased to receive specimens of trees and shrubs, and in fact of any plants from any part of the state, and to be of all service possible to the people of Nebraska in the identification of any plants that they may care to send to him. Good specimens, properly pressed, which may be sent in will be added to the collections of the Botanical Survey of Nebraska with full credit to the collectors and localities concerned.

KEY TO THE GENERA OF NEBRASKA TREES

- A. Leaves needle-like, awl-shaped, or scale-like, mostly evergreen
1. Leaves needle-like, solitary, not clustered
 - a¹ Leaves scattered in a bristly manner on all sides of the twigs, 4-sided or angled, harsh; leafless twigs very rough; buds scaly **Spruce**, p. 13.
 - a² Leaves usually in 2 opposite ranks on the twigs, flat, soft; leafless twigs comparatively smooth; buds resinous or waxy **Fir**, p. 31.
 2. Leaves scale-like or awl-shaped, small, blunt or sharp-pointed, divergent or appressed, closely clustered
 - a¹ Leaves scale-like, very small, blunt, flattened; twigs flattened; cones small, composed of few, light brown, woody scales; tree bright, yellow green **Arbor Vitae**, p. 33.
 - a² Leaves awl-shaped, or some of them scale-like, often both kinds on the same tree; cone a small, bluish berry; tree dark, bluish green **Juniper**, p. 35.
 3. Leaves needle-like, in clusters of 2 to many
 - a¹ Leaves in 2-, 3- or 5-leaved clusters, with a shallow sheath at the base; persistent for several years; foliage generally rather coarse **Pine**, p. 13.
 - a² Leaves on all twigs except the current growth in clusters of ten to more, on short, very stubby branches; leaves on current growth single and scattered, all deciduous in autumn; foliage rather soft **Tamarack**, p. 25.
- B. Leaves broad and flat, not needle-like, awl-shaped or scale-like, all deciduous in autumn or winter in our climate
1. Leaves simple, i. e., not compound or divided into leaflets
 - a¹ Leaves opposite or in whorls about the twigs
 - b¹ Margin of leaf finely serrate, entire or rarely toothed or lobed
 - c¹ Leaf large, entire or rarely shallowly lobed, heart-shaped, whorled; fruit a long slender pod **Catalpa**, p. 15.
 - c² Leaf smaller, finely serrate, not heart-shaped; fruit fleshy, plum-like **Black Haw**, p. 163.
 - b² Margin of leaf distinctly and regularly lobed or cut, the lobes coarse or fine **Maple**, p. 15.
 - a² Leaves alternate on the twigs, never opposite
 - b¹ Margin of leaf entire or merely wavy, not toothed or lobed
 - c¹ Leaves narrow, usually about $\frac{1}{2}$ inch wide, from 2 to 4 inches long, very silvery on the lower surface **Russian Olive**, p. 161.
 - c² Leaves much larger, 2 to 3 inches wide, 3 to 6 inches long, not at all silvery
 - d¹ Twigs thorny, juice milky **Osage Orange**, p. 105.
 - d² Twigs not thorny, juice not milky **Pawpaw**, p. 111.
 - c³ Leaves very broad, often as broad as long, heart-shaped, smooth; flowers bright pink **Red Bud**, p. 133.
 - b² Margin of leaf finely or coarsely toothed

- c¹ Leaves narrow, several times as long as wide, usually with many fine, close or widely scattered teeth
 - d¹ Buds with a single bud scale Willow, p. 12.
 - d² Buds with several bud scales Poplars and Cottonwoods, p. 13.
- c² Leaves broader, only two or three times as long as broad, sometimes as broad or broader than long
 - d¹ Leaves oblique at the base, i. e., lop-sided
 - e¹ Leaves about as broad as long, heart-shaped, coarsely toothed, teeth all alike Basswood or Linden, p. 149.
 - e² Leaves considerably longer than broad
 - f¹ Leaves thin, soft, finely toothed, point long-tapering, bark in very distinct layers; buds small, gray Hackberry, p. 103.
 - f² Leaves thick, coarse, coarsely toothed, point abruptly tapering; bark not in conspicuous layers; buds large, brown Elm, p. 15.
- d² Leaves not oblique at the base
 - e¹ Leaves about as broad as long, teeth large and coarse or the leaf margin merely scalloped
 - f¹ Leaf dark green, shiny above, densely white-wooly beneath Poplar, p. 13.
 - f² Leaf bright green above, soft-hairy but not white beneath; juice milky Mulberry, p. 107.
 - e² Leaves considerably longer than broad
 - f¹ Marginal teeth fine, leaf thin
 - g¹ Bark smooth, bluish-gray, often mottled; trunk often fluted Blue Beach, p. 71.
 - g² Bark rough, brownish, more or less stringy; trunk not fluted Hornbeam, p. 69.
 - g³ Bark smooth, dark brown, bronze, cream-colored or snow white, often separating in thin papery sheets when white Birch, p. 14.
 - f² Marginal teeth coarse, leaves firm, tough
 - g¹ Twigs armed with long stiff thorns; leaf often deeply lobed Hawthorne, p. 125.
 - g² Twigs not armed with stiff thorns
 - o¹ Leaves more or less hairy beneath
 - p¹ Fruit an acorn Oak, p. 14.
 - p² Fruit a small apple Apple, p. 13.
 - o² Leaves slightly or not at all hairy
 - p¹ Bark dark brown, more or less scaly Plum and Cherry, p. 15.
 - p² Bark pale brown or grayish, not scaly Juneberry, p. 117.

- b³ Margin of leaf more or less deeply lobed
 - c¹ Leaf lobes rounded at the tips **Oak**, p. 14.
 - c² Leaf lobes pointed at the tips, often bristle-pointed, more or less serrate or toothed
 - d¹ Leaf lobes very coarsely toothed
 - e¹ Lobes few, large, not bristle-tipped; bark light green or white, scaly **Sycamore**, p. 109.
 - e² Lobes several, smaller, often bristle-tipped; bark not greenish or white **Oak**, p. 14.
 - d² Leaf lobes finely toothed
 - e¹ Twigs more or less thorny **Hawthorne**, p. 125.
 - e² Twigs not thorny **Mulberry**, p. 107.
- 2. Leaves compound, i. e., divided into leaflets
 - a¹ Leaves opposite
 - b¹ Leaves pinnately compound; fruit dry, winged; buds small
 - c¹ Leaflets 7 to 9, not coarsely toothed; winged fruits single, paddle-shaped **Ash**, p. 15.
 - c² Leaflets 3 to 5, coarsely toothed; winged fruits double, not paddle-shaped **Boxelder**, p. 15.
 - b² Leaves palmately compound; fruit a large, dry bur; buds very large **Buckeye and Horsechestnut**, p. 15.
 - a² Leaves alternate
 - b¹ Leaves pinnately compound
 - c¹ Branches with low thorns in pairs; flowers white, large, very fragrant **Black Locust**, p. 127.
 - c² Branches not thorny; flowers inconspicuous, not fragrant
 - d¹ Leaflets 11 to 41, large or small, the largest usually at the base of the leaf, upper leaflets becoming gradually smaller towards the tip of the leaf
 - e¹ Leaflets large, 3 to 5 inches long, entire except for a few coarse teeth at the base **Tree of Heaven**, p. 134.
 - e² Leaflets smaller, usually about or less than 3 inches long, usually finely toothed along the whole margin
 - f¹ Trunk and branches armed with simple or branched thorns **Honey Locust**, p. 129.
 - f² Trunk and branches not thorny
 - g¹ Terminal leaflet usually missing; leaflets 1 inch or more wide, usually soft-hairy and aromatic **Walnut**, p. 13.
 - g² Terminal leaflet usually present; leaflets less than 1 inch wide, smooth, not aromatic **Mountain Ash**, p. 115.
 - d² Leaflets 5 to 11, terminal leaflet often much larger than the lateral leaflets **Hickory**, p. 14.
 - b² Leaves twice-pinnately compound
 - c¹ Tree with large coarse thorns; bark dark brown or reddish, smooth or pebbly; leaves 6 to 12 inches long, leaflets oval, usually less than 1 inch long **Honey Locust**, p. 129.
 - c² Tree not thorny; bark very rough and furrowed, bright, reddish brown, more or less scaly; leaves 1 to 4 feet long, leaflets about 2 inches long, broadly ovate **Kentucky Coffee Tree**, p. 131.

KEYS TO THE SPECIES

The Pines

- A. Leaves 2 to 3 in each cluster, stiff and harsh
 - 1. Leaves 2 in each cluster
 - a¹ Leaves 1½ to 3 inches long; bark in top of tree reddish-brown, more or less scaly **Scotch Pine, p. 21.**
 - a² Leaves 3 to 6 inches long; bark in top of tree dark gray or black, not scaly **Austrian Pine, p. 19.**
 - 2. Leaves 3 in each cluster, 3 to 6 inches long; bark more or less scaly **Western Yellow Pine, p. 23.**
- B. Leaves 5 in each cluster, lax and soft **White Pine, p. 17.**

The Spruces

- A. Leaves ¾ to 1 inch long, not sharp-pointed, not bluish
 - 1. Cones 1 to 2 inches long, maturing the first season; leaves ill-smelling when bruised **White Spruce, p. 29.**
 - 2. Cones 3 to 6 inches long, maturing the second season; leaves not ill-smelling when bruised **Norway Spruce, p. 27.**
- B. Leaves 1 to 2 inches long, very sharp-pointed, bluish, especially on the young growth; cones 2 to 3 inches long **Blue Spruce, p. 27.**

The Willows

- A. Leaves broadly or narrowly lanceolate; stamens 3 or more; trees 20 to 50 feet tall
 - 1. Leaves broadly lanceolate or lanceolate-ovate; petioles slender **Almond-leaf Willow, p. 37.**
 - 2. Leaves narrowly lanceolate; petioles short **Black Willow, p. 39.**
- B. Leaves linear or linear-lanceolate; stamens 2; trees usually less than 20 feet tall **Sandbar Willow, p. 41.**

The Poplars and Cottonwoods

- A. Petioles and lower surfaces of leaves densely white-hairy; upper surfaces dark green and shining **White Poplar, p. 51.**
- B. Petioles and lower surfaces of leaves not white-hairy
 - 1. Petioles cylindrical, not flattened; leaves ovate-lanceolate, often quite odoriferous **Balsam Poplar, p. 45.**
 - 2. Petioles strongly flattened
 - a¹ Buds resinous or sticky; leaves not orbicular
 - b¹ Leaves green on both sides
 - c¹ Leaves broader than long; lateral branches abruptly ascending; crown very narrow and congested, often with many dead twigs **Lombardy Poplar, p. 49.**
 - c² Leaves longer than broad; lateral branches wide-spreading; crown open
 - d¹ Leaves broadly deltoid, often heart-shaped at the base **Common Cottonwood, p. 43.**
 - d² Leaves ovate-lanceolate, wedge-shaped at the base, with long tapering point **Narrow-leaf Cottonwood, p. 55.**
 - d³ Leaves rhombic-lanceolate, wedge-shaped at the base, abruptly pointed **Rydberg's Cottonwood, p. 53.**
 - a² Buds slightly or not at all resinous; leaves nearly orbicular, in almost constant vibration **Quaking Aspen, p. 46.**

The Walnuts

- A. Nut globular or spherical; leaflets 15 to 23; pith pale brown or yellow; tree common **Black Walnut, p. 57.**
- B. Nut ovoid or oval, pointed; leaflets 11 to 17; pith dark chocolate brown; tree not common **Butternut, p. 59.**

The Hickories

- A. Bud scales numerous, overlapping; husk of nut thick, not winged; nut shell thick; kernel sweet, edible
1. Bark exfoliating in long, loose plates, i. e., shaggy; shell whitish, thick
 - a¹ Leaflets usually 3 to 5; nut rounded at base **Shagbark**, p. 63.
 - a² Leaflets usually 7 to 9; nut pointed at base **Bignut Hickory**, p. 65.
 2. Bark in close, rough ridges, not shaggy; foliage fragrant when bruised; nut brown, 4-ridged, shell thick and brownish; kernel small but edible **Mockernut**, p. 67.
- B. Bud scales few, edge to edge, sulphur colored; husk of nut thin and winged; shell thin; kernel bitter, not edible **Bitternut**, p. 61.

The Birches

- A. Bark creamy white or snow white, shiny, separating in thin, papery layers; large tree **Paper Birch**, p. 73.
- B. Bark dark brown or bronze colored, very shiny, not separating in thin, papery layers, small tree **Black Birch**, p. 75.

The Oaks

- A. Leaves deeply cut or lobed
1. Lobes of leaf acute, bristle-tipped; acorns mature at end of the second season
 - a¹ Lower surface of leaves more or less hairy
 - b¹ Lobes of leaf usually 7; buds hoary; inner bark yellow; large, common tree **Black Oak**, p. 79.
 - b² Lobes of leaf usually 3; buds rusty; inner bark not yellow; bark scales nearly square; small tree or shrub, not very common **Black Jack Oak**, p. 85.
 - a² Lower surface of leaves smooth or nearly so
 - b¹ Acorn cup deep, top-shaped or cup-shaped, inclosing one-third to one-half of acorn **Scarlet Oak**, p. 83.
 - b² Acorn cup shallow, saucer-shaped, inclosing only the base of the acorn
 - c¹ Upper leaf surface shiny; lowermost branches drooping; acorn about one-half inch long; flattish **Pin Oak**, p. 81.
 - c² Upper leaf surface usually dull; lowermost branches not drooping; acorn about 1 inch long **Red Oak**, p. 77.
 2. Lobes of leaf rounded, not bristle-tipped; acorns maturing in the first season
 - a¹ Leaves cut nearly to the mid-rib by a pair of deep indentations near the middle of the leaf; acorn $\frac{1}{2}$ to $1\frac{1}{2}$ inch long, deeply covered by a large, hoary, fringed cup **Bur Oak**, p. 91.
 - a² Leaves not cut deeply by a pair of indentations nearly to the mid-rib; acorn about $\frac{3}{4}$ inch long, about $\frac{1}{4}$ covered by a thin, hairy, warty cup **White Oak**, p. 87.
- B. Leaves not deeply cut or lobed
1. Margin of leaf entire or wavy-toothed with rounded teeth
 - a¹ Margin of leaf entire or merely wavy; acorn stalks about $\frac{1}{2}$ inch long; acorn $\frac{1}{2}$ inch long **Laurel Oak**, p. 95.
 - a² Margin of leaf wavy-toothed with prominent, rounded and shallow teeth, very rarely lobed; acorn about 1 inch long, borne on stalks 1 to 4 inches long **Swamp White Oak**, p. 89.
 2. Margin of leaf coarsely toothed with quite uniform, sharp-pointed teeth; acorn stalk usually less than $\frac{1}{2}$ inch long **Yellow Oak**, p. 93.

The Elms

- A. Leaves usually rough on one or both surfaces; branches without corky ridges
 - 1. Leaves rough above, smooth beneath; petioles smooth; bud scales smooth; fruit notched at the apex, hairy-fringed; inner bark not mucilaginous **White Elm, p. 97.**
 - 2. Leaves rough on both sides; petioles hairy; bud scales very brown-hairy; fruit not notched at the apex, not hairy-margined; inner bark mucilaginous **Slippery Elm, p. 99.**
- B. Leaves smooth on both sides; branches often with prominent corky ridges; fruits hairy on the sides, wing narrow **Cork Elm, p. 101.**

Plums and Cherries

- A. Flowers in elongated clusters terminating leafy branchlets; trees not thorny
 - 1. Leaves thinnish, margins with slender, spreading, pointed teeth **Choke Cherry, p. 123.**
 - 2. Leaves thickish, margins with incurved, more or less callous teeth **Wild Black Cherry, p. 121.**
- B. Flowers in tufted, axillary clusters; trees more or less thorny, often shrubby and growing in thickets **Wild Plum, p. 119.**

The Maples

- A. Leaves simple, palmately veined and lobed; twigs not whitish or bluish
 - 1. Flowers appearing in very early spring before the leaves; leaves sharply cut or lobed, silvery beneath; branches and whole tree often distinctly pinkish or reddish **Silver Maple, p. 137.**
 - 2. Flowers appearing after the leaves; leaves not silvery beneath; twigs and branches not reddish, usually gray
 - a¹ Petioles exuding a milky juice when cut; bark fissured, but not particularly scaly **Norway Maple, p. 141.**
 - a² Petioles not exuding a milky juice when cut; bark deeply furrowed, often in plates **Sugar Maple, p. 139.**
- B. Leaves pinnately compound; twigs whitish or bluish; trees often irregular or ill-shapen **Box-elder, p. 143.**

Buckeye and Horsechestnut

- A. Flowers yellowish; buds not resinous; leaflets usually 5; a small, more or less bushy tree **Buckeye, p. 145.**
- B. Flowers white; winter buds resinous; leaflets usually 7; a large, erect, beautiful tree **Horsechestnut, p. 147.**

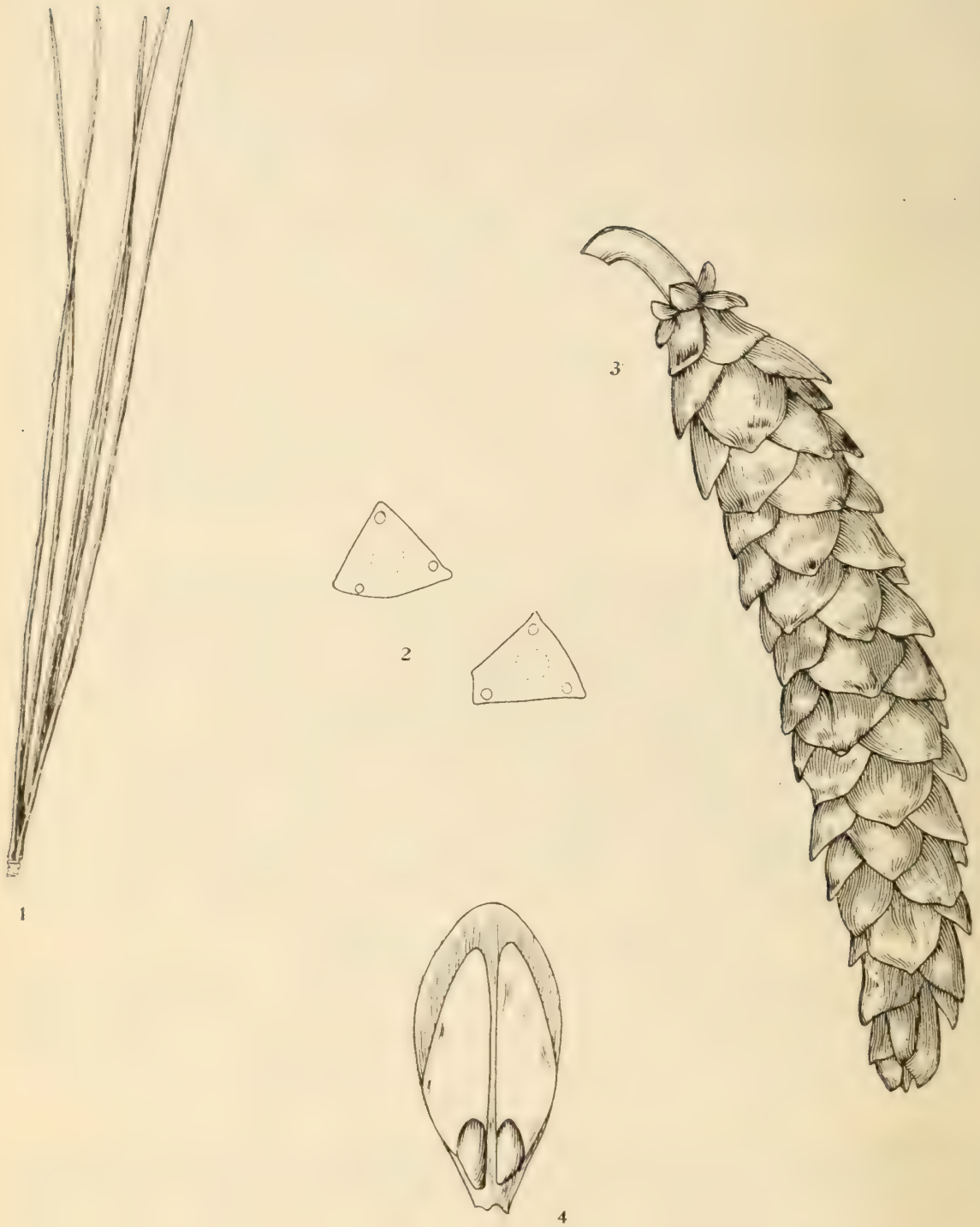
The Ashes

- A. Twigs, petioles and lower surfaces of leaflets smooth
 - 1. Wing of the fruit terminal; leaflets entire or obscurely and finely serrate or toothed **White Ash, p. 151.**
 - 2. Wing of the fruit extended along the side of the seed, often half-way to the base; leaflets finely serrate **Green Ash, p. 155.**
- B. Twigs, petioles and lower surfaces of leaflets more or less hairy; wing of fruit as in Green Ash **Red Ash, p. 153.**

The Catalpas

- A. Flowers 1½ inches wide; prominently yellow spotted; septum of pod narrow in cross section **Common Catalpa, p. 159.**
- B. Flowers 2½ inches wide, not prominently yellow spotted; septum of pod broad in cross section **Hardy Catalpa, p. 157.**

WHITE PINE



1. Cluster of leaves, x 1.
2. Cross-sections of leaves, enlarged.
3. Partly opened cone, x $\frac{3}{4}$.
4. Cone-scale with seeds, x 1.

(From Otis: Mich. Trees)

WHITE PINE

Pinus strobus L.

The Pine Family. Conifers

PINACEAE

Habit and Habitat: A large tree, 60-80 feet tall, with a trunk diameter of 2-4 feet, occasionally 100-150 feet high and 5-7 feet in diameter, trees even 250 feet tall formerly existed; when young, slender horizontal or slightly ascending branches produce regular whorls about the straight main stem, forming a wide pyramidal crown, which becomes more or less irregular in the forest. Prefers a light, fertile, loamy soil and sandy soils of granitic origin, also on banks of streams and river flats.

Leaves and Buds: Leaves in fascicles or clusters of 5, 3-5 inches long, slender, soft, straight, needle-shaped, 3-sided, bluish green, whitened on the inner side, mostly turning pale yellow and falling in September of their second season or a little later, commonly in brush-like tufts at the end of the twigs. Winter-buds oblong-ovoid, sharp-pointed, yellowish-brown, $\frac{1}{4}$ - $\frac{1}{2}$ inch long.

Flowers and Fruits: Flowers produced in June, both the staminate and pistillate in closely-flowered cones. Staminate cones oval, clustered at the base of the leafy growing shoots of the season, bases of the cones surrounded by a number of papery scales, about $\frac{1}{3}$ inch long, yellow. The pistillate cones cylindrical, about $\frac{1}{4}$ inch long, pinkish-purple, long-stalked. Fruit a woody cone maturing during the second summer, falling during the winter or following spring, pendent, short-stalked, narrow-cylindrical, often curved, greenish at first, 4-10 inches long; scales becoming light brown, rather loose, slightly thickened and rounded at the apex; seeds reddish-brown, $\frac{1}{4}$ inch long, at the base of a yellowish-brown, membranous wing about 1 inch long.

Bark, Twigs and Wood: The bark on the twigs is at first rusty-hairy, soon becoming smooth and yellowish-brown in their first winter, finally thin, smooth, greenish; on old branches and the main trunk becoming 1-2 inches thick and deeply divided by shallow fissures into broad, connected ridges covered with small closely appressed scales. Wood very soft, light, weak, compact, straight-grained, resinous, easily worked, light, pinkish-brown with lighter colored sapwood; shrinks or swells very slightly with changes in the atmosphere; one of the finest and most famous of all North American woods.

Distribution in the State: The white pine does not occur naturally in Nebraska, the nearest approach in its natural range being north-eastern Iowa. The species occurs throughout northeastern United States from Iowa and Minnesota eastward, southeastern Canada and along the Appalachian mountains to northern Georgia.

Remarks: This is one of the tallest and most magnificent trees of eastern United States and formerly was the source of great supplies of its famous lumber produced especially in Michigan, Wisconsin, Minnesota and Pennsylvania. Stands formerly existed which yielded over 100,000 feet board measure of sound timber per acre. One of our most rapidly growing and graceful evergreens for ornamental planting. Not as hardy as Scotch pine or Austrian pine in our climate. The bark furnishes the syrup of white pine, used as a medicine.

AUSTRIAN PINE. BLACK PINE



1. Cluster of leaves, x 1.
2. Cross-section of leaf, enlarged.
3. Unopened cone, x 1.
4. Partly opened cone, x $\frac{1}{2}$.
5. Cone-scale with seeds, x 1.

(From Otis: Mich. Trees)

AUSTRIAN PINE. BLACK PINE

Pinus austriaca Höss

The Pine Family

PINACEAE

Habit and Habitat: A large, massive tree, usually 50-80 feet high, with a trunk diameter of 2-4 feet, although often larger in its native European forests; the massive lateral branches and coarse, stiff twigs form a bushy, open, rounded or oval crown. Flourishes in a wide range of soils.

Leaves and Buds: The leaves are borne in fascicles or clusters of 2 in a shallow, basal sheath, 3-6 inches long, slender, needle-shaped, rigid, sharp-pointed, curved towards the twig, one side flat, the other rounded, deep bluish-green on both surfaces, falling irregularly after 3-6 years. Winter-buds oblong-conical, sharp-pointed, reddish-brown, resinous, about $\frac{1}{2}$ inch long, becoming large and whitish as growth begins.

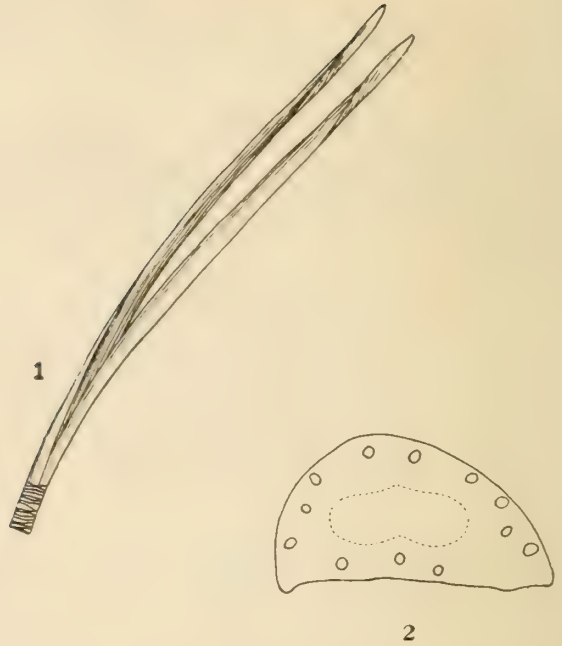
Flowers and Fruits: The flowers in cones, produced in May or June. Staminate cones clustered, cylindrical, short-stalked, bright yellow, about $\frac{3}{4}$ inch long, scales numerous, pollen in great quantity; pistillate cones cylindrical, one or two in a place, towards the ends of the twigs, small, bright red, short-stalked or stalkless. Fruit a tough, coarse, woody cone ripening at the close of the first growing season, opening two years after full size, shedding many of the seeds but remaining attached to the twigs for several years, erect, stalkless, ovoid, 2-3 inches long; scales smooth, shiny, thickened at the apex and ending in a short spine at the center; seed reddish-brown, often mottled, $\frac{1}{4}$ inch long, at one end of a membranous wing $\frac{3}{4}$ inch long; two winged seeds produced by each scale of the cone except those at the tip and base of the cone.

Bark, Twigs and Wood: Bark thick and gray or nearly black on old trunks, coarsely and deeply fissured by connected ridges, often somewhat scaly; twigs brownish to olive-colored and smooth, becoming darker and roughened with age. Wood very resinous, rich in turpentine, light, soft, strong, durable, reddish-brown with thick, yellowish to reddish-white sapwood; excellent for stove wood and for rough construction.

Distribution in the State: Austrian pine is not native to Nebraska or to North America. It is, however, an important timber-producing tree of the forests of central and southern Europe where it abounds. It has been planted very widely in the United States.

Remarks: The Austrian pine is one of the best trees for planting in Nebraska since it is very hardy under our conditions; it is rather fast growing, long-lived and free from serious pests. It is easily grown from the seed and transplants readily when small or even when quite large if moved in the winter. This species endures the hot, dry winds which occasionally sweep over our state better than any other introduced conifer. The regular outline of the tree and the great, wide-spreading, candelabra-like crown is particularly attractive even though the tree as a whole is rather coarse. We ought to plant Austrian pine more frequently than we do.

SCOTCH PINE



1. Cluster of leaves, x 1.
2. Cross-section of leaf, enlarged.
3. Unopened cone, x 1.
4. Partly opened cone, x 1.
5. Cone-scale with seeds, x 1.

(From Otis: Mich. Trees)

SCOTCH PINE
Pinus sylvestris L.

The Pine Family
PINACEAE

Habit and Habitat: A large tree, 60-80 feet tall, with a trunk diameter of 1-2 feet, occasionally larger; the trees rather inclined to be more or less irregular or crooked; the lower lateral branches persist, forming with the spreading upper branches a massive, rounded, wide-spreading crown, although not so coarse as the Austrian pine. Prefers rich, moist loamy soil and a cold climate, but does well under a great variety of soil and climatic conditions.

Leaves and Buds: Leaves in fascicles or clusters of two, $1\frac{1}{2}$ -3 inches long, stiff, more or less twisted, spreading slightly from the shallow sheath, flat on one side, rounded on the other, bluish-green or often more or less whitish, persisting upon the twigs for 3-4 years. Winter-buds oblong-ovoid, sharp-pointed, reddish-brown, resinous, about $\frac{1}{4}$ inch long.

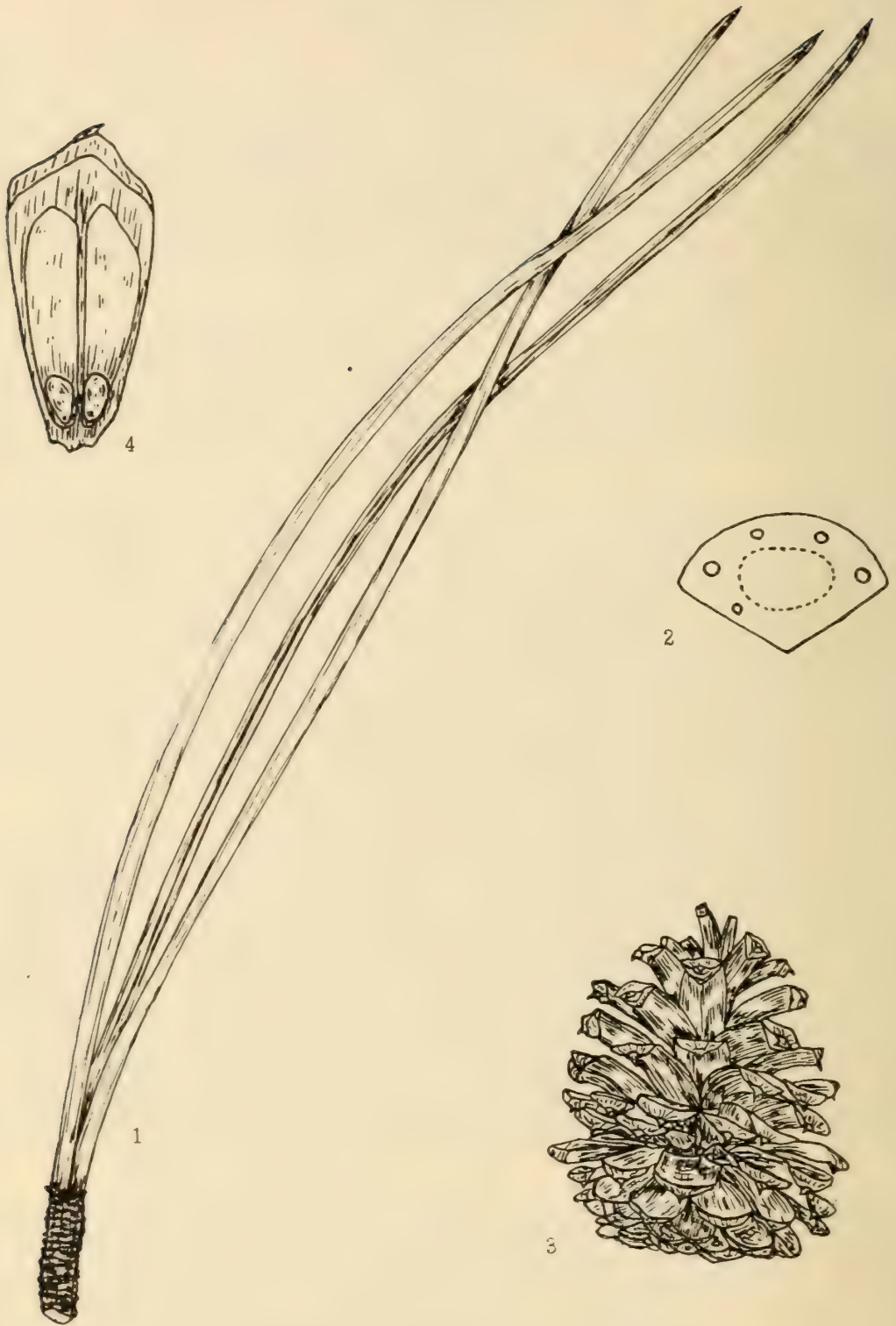
Flowers and Fruits: Flowers produced in cones which appear in May or June. Staminate cones ovoid, short-stalked, yellowish, about $\frac{1}{4}$ inch long, composed of many papery scales arranged spirally about the axis. Pistillate cones oblong, reddish, short-stalked; scales fewer, fleshy, about $\frac{1}{4}$ inch long. Both kinds of cones are produced near the tips of the twigs, the pistillate often at the very end of the current twigs, singly or in groups of 2-3. Fruit a woody cone maturing in the autumn of the second season, and falling about as soon as ripe, pendent, stout-stalked, ovoid-conical, $1\frac{1}{2}$ -2 $\frac{1}{2}$ inches long; scales dull, grayish-brown, thickened at the tips into 4-sided, recurved points; seeds reddish-brown, $\frac{1}{8}$ - $\frac{1}{4}$ inch wide, with narrow wings about $\frac{3}{4}$ inch long.

Bark, Twigs and Wood: The bark on the upper part of the main stem and on the larger lateral branches is reddish to cinnamon-colored or orange-brown, becoming thick, grayish or dark orange-brown on old stems and main trunks, coarsely and deeply fissured into broad ridges which exfoliate in large, irregular, thin scales. The bark in the upper portion of many large trees is also quite papery-scaly, and exfoliates in the form of thin, irregular cinnamon-colored or orange-red scales. The wood is light, soft, close grained, straight-grained, strong, easily worked, reddish-brown, with thick yellow to whitish sapwood; valuable for interior trim, and is largely used in Europe, where it is the common timber pine. The celebrated pine of Norway and the Baltic countries is of this species where the best type of the species is called "Riga pine."

Distribution in the State: Scotch pine does not occur naturally in any part of North America, but is very common and abundant in northern Europe and Asia where it is a very important timber tree. The species has been very widely planted for ornament and for wind-breaks in this country. Its rapid growth and ready adaptation to a wide variety of conditions have made it a popular tree for these purposes, but it is rather short-lived and not to be chosen in preference to Austrian pine.

Remarks: This pine yields considerable supplies of the common European turpentine which is used in the manufacture of various medicines. The leaves are made into a crude sort of clothing.

WESTERN YELLOW PINE



1. Cluster of leaves, x 1.
2. Cross-section of leaf, enlarged.
3. Opened cone, x $\frac{1}{3}$.
4. Cone-scale with seeds, x 1.

(Original)

WESTERN YELLOW PINE

Pinus ponderosa Dougl.

The Pine Family

PINACEAE

Habit and Habitat: A massive tree, sometimes 150-230 feet high, with a massive trunk 5-8 feet in diameter, usually considerably smaller, the short, thick, many-forked, often pendulous branches generally turned upward at the ends and forming a regular, spire-like, open crown or in arid regions a broader, and often round-topped crown supported by a short, stocky trunk. Abundant in dry and moist soils in open park-like stands or in rather close, pure forests of wide extent on mountain slopes, dry valleys and high mesas. Demands much light.

Leaves and Buds: The leaves are in clusters of two or three, tufted at the ends of naked twigs, stout, dark yellow-green, 5-11 inches long, mostly falling during their third season. Terminal bud $\frac{1}{2}$ - $\frac{3}{4}$ inch long; lateral buds about half as long, ovate, gradually narrowed and acute at the apex, light chestnut-brown.

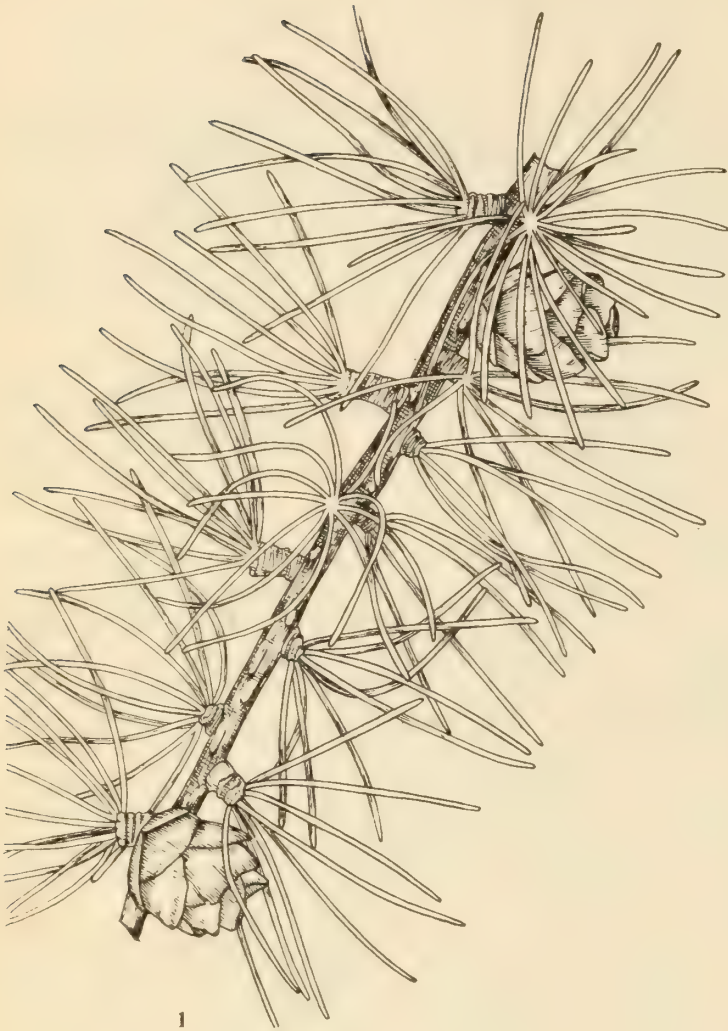
Flowers and Fruits: Flowers produced in cones in May or June; staminate in clusters at the base of the current shoots, yellow, $\frac{1}{4}$ - $\frac{1}{2}$ inch long; pistillate cones clustered or in pairs, short-stalked, dark red, scales fleshy. Fruit a woody cone maturing in August of the second season and shedding the seeds mainly during September, oval, horizontal or declining, stalkless or short-stalked, 3-6 inches long, often clustered, bright green or purple when fully grown, becoming light reddish-brown, with narrow scales thickened at the apex and armed with slender prickles, mostly falling soon after they open and shed their seeds, generally leaving the lower scales attached to the twig. Seeds ovate, acute, full and rounded, $\frac{1}{4}$ inch long, with a thin, often mottled shell and surrounded by a membranous wing about 1 inch long.

Bark, Twigs and Wood: The bark of old trunks is marked by very broad, shield-like, russet-red plates 3-4 inches thick and covered with small concave, cinnamon-red scales; younger trees, up to 2 feet in diameter, are often unlike older ones in having dark reddish-brown or blackish, narrowly furrowed bark, the "black jack" of lumbermen; young shoots and twigs are yellowish-green, orange colored or later brownish and emit a strong odor of orange when bruised. Wood ranging from pale lemon-yellow to orange-brown or reddish-yellow, with thin nearly white sapwood, quite hard, resinous, strong, fine-grained; largely manufactured into lumber, mine timbers, railway ties, fencing and fuel.

Distribution in the State: This is our only native pine tree, it being found along Pine Ridge and the bluffs of the Niobrara river eastward to Keya Paha and Holt counties, also in the rough country of Scottsbluff, Banner and Kimball counties and in the breaks of the North Platte river eastward to Morrill and Garden counties and in a number of scattered, indefinitely determined localities in other parts of the state. Map 1.

Remarks: The most extensive pine forests in North America are the western yellow pine forests of New Mexico and Arizona from which large supplies of lumber have been taken and in which many mills are working now. The most extensive forests in Nebraska are also composed of this species as it is found on the hills and slopes of Pine Ridge in Sioux and Dawes counties in northwestern Nebraska.

TAMARACK. LARCH



1



4



3



2

1. Autumn branchlet, with leaves and cones, x 1.
2. Cross-section of leaf, enlarged.
3. Fruiting branchlet in winter, x 1.
4. Cone-scale with seeds, x 2.

(From Otis: Mich. Trees)

TAMARACK. LARCH
Larix americana Michx.

The Pine Family
PINACEAE

Habit and Habitat: A medium-sized tree, 50-60 feet in diameter, with trunk diameter of 1-2 feet, sometimes taller; the small horizontal branches forming in early life a tree with narrow, regular pyramidal crown, or later and in the open, forming a broad, open, regular or irregular crown of horizontal branches. Found on well-drained uplands or the borders of cold, deep swamps where it often forms forests of very closely crowded trees.

Leaves and Buds: The leaves are linear or needle-like, with blunt apex, triangular or rounded in section, $\frac{3}{4}$ -1 $\frac{1}{2}$ inches long, bright green, scattered singly on the leading or current shoots or clustered in many-leaved tufts on the short lateral, knob-like branches of the older wood; some of the single leaves have low buds at their base from which the dwarf, stubby branches develop the following year which produce the clusters of leaves. Buds small, low, shiny, globose, dark red. All leaves turning yellow and deciduous in early autumn.

Flowers and Fruits: Flowers appearing with the leaves, produced in cones; staminate cones stalkless, globose, yellow, composed of many short-stalked anthers spirally arranged about the central axis; the pistillate cones oblong, short-stalked, bearing orbicular, light colored, spirally arranged scales with green tips, and also orbicular red scales. Fruit a leathery or woody cone maturing in the autumn of the first season, but may remain on the tree for many months after maturity, ovoid or oblong, obtuse, light brown, $\frac{1}{2}$ - $\frac{3}{4}$ inch long, short-stalked, composed of about 20 leathery or woody scales which are nearly as wide as long.

Bark, Twigs and Wood: Bark of the trunk $\frac{1}{2}$ - $\frac{3}{4}$ inch thick, separating into thin, closely appressed, reddish-brown scales; twigs at first green, grayish, or whitish, later light orange-brown, finally dark brown and becoming scaly rather early. The wood is hard, heavy, very strong, rather coarse-grained, durable in contact with the soil, light brown, with thin nearly white sapwood; used largely in ship building, canoe making, fence posts, railway ties, telegraph and telephone poles, etc.

Distribution in the State: The tamarack is not found naturally in Nebraska but is abundant in the great forests of northeastern United States and in Canada where it is a regular member of the forest flora of swamps along with such trees as the black spruce. Planted somewhat in Nebraska but not very successful unless planted in rather low, moist sites.

Remarks: The most striking characteristic of the tamarack is the annual shedding of its leaves and the consequent bare nature of the tree during the winter, that is, this tree is a deciduous conifer while the great majority of conifers are "evergreens." The European tamarack, *Larix europea*, is planted quite commonly in this country especially in parks and as a lawn tree and as a rule is somewhat more successful than our American species because it naturally prefers a loose, well-drained soil and consequently may thrive where the American larch would die. The leaves and cones of the foreign species are longer than those of our native larch. In certain situations it is a very desirable tree to plant as a screen or windbreak.

NORWAY SPRUCE



1. Branchlet with partly open cone, x $\frac{1}{2}$.
2. Leaf, x 3.
3. Cross-sections of leaves, enlarged.
4. Cone-scale with seeds, x 1.

(From Otis: Mich. Trees)

NORWAY SPRUCE

Picea excelsa Link

The Pine Family

PINACEAE

Habit and Habitat: A tree, commonly 50-70 feet tall, with a trunk diameter of 1-3 feet; the graceful ascending or pendulous, horizontal branches form a dense, conical or pyramidal, spire-topped crown; many of the longer, lower branches persist so long that they often droop so noticeably as to touch the ground. Prefers moist, sandy or loamy soils but readily adapts itself to wide variations in soil and climate.

Leaves and Buds: Leaves needle-like, spirally arranged about the twigs, $\frac{3}{4}$ -1 inch long, crowded, deep, shining green, rigid, curved, acute but not needle-pointed, persistent for 5-7 years. Winter-buds ovoid, acute, reddish-brown, $\frac{3}{8}$ inch long, dry, not resinous.

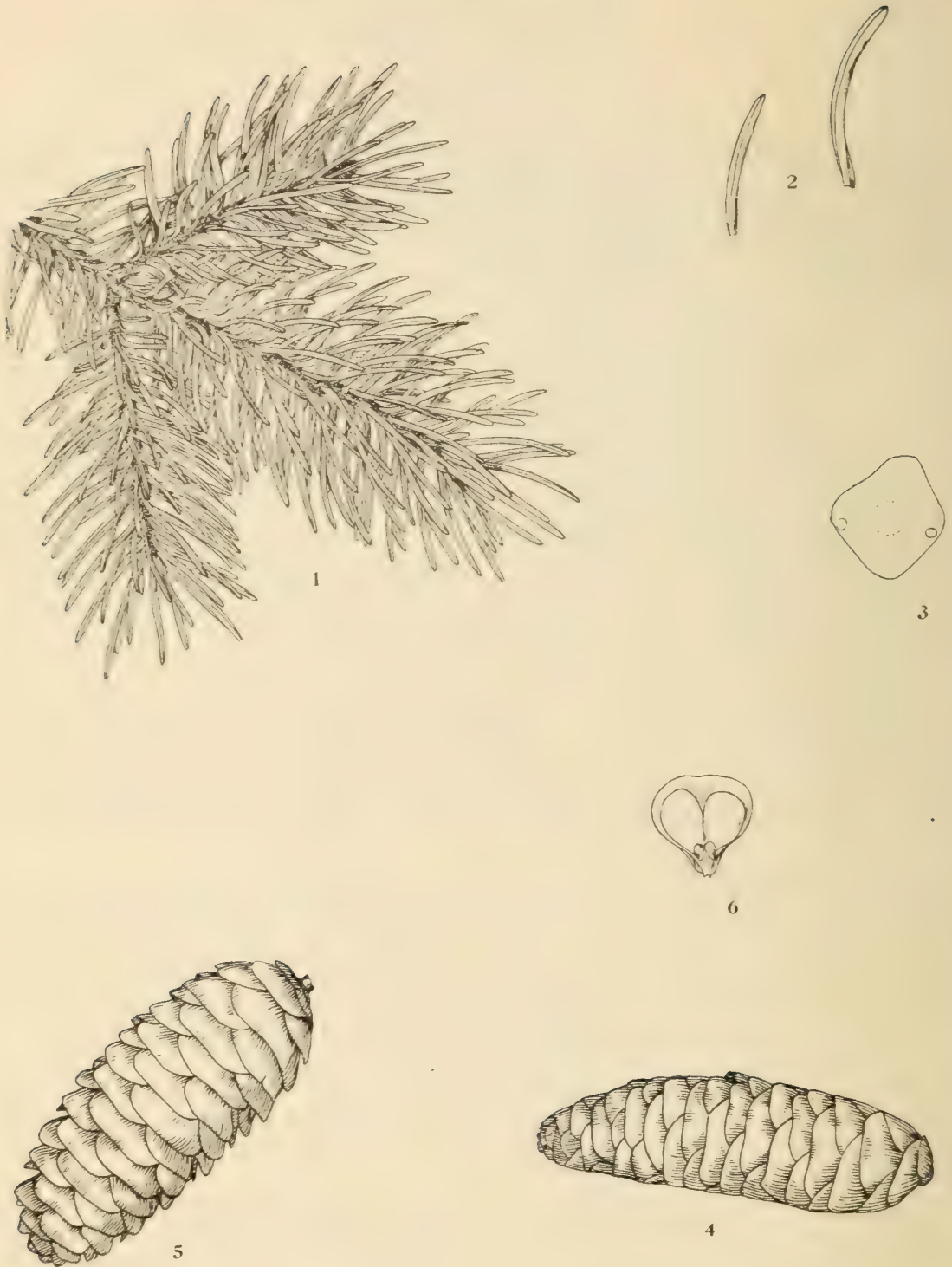
Flowers and Fruits: Flowers produced in cones which usually appear in May. Staminate cones ovoid or globose, long-stalked, reddish or yellowish, $\frac{3}{4}$ -1 inch long. The pistillate cones cylindrical, stalk-less, erect, $1\frac{1}{2}$ -2 inches long, scales very numerous, bright green or tinged with red. Fruit a light brown, elastic, leathery to woody cone, 3-6 inches long, maturing in the autumn of the second season, stalkless, cylindrical, pendent from the tips of the uppermost branches, often in great numbers, tapering toward the base, rounded at the apex; seeds red-brown, rough, $\frac{1}{8}$ inch long, with long, graceful wings.

Bark, Twigs and Wood: Bark on old trunks thin, grayish-brown, slightly fissured and scaly; the young twigs are red or orange-brown, smooth and corrugated. The wood is light, strong, tough, elastic, soft, fine-grained, white, with thick, indistinguishable sapwood; the wood is known as "white deal" in Europe, and is used for a great many purposes.

Distribution in the State: As the name implies, this species grows in Norway, it being a native of the northern portion of Europe and Asia. It is the great tree of the Alps, to which much of the beauty of the scenery in those mountains is due. Norway spruce is very commonly and widely planted in this country and in this state. It does better in the northern states but is quite successful as far south as Ohio. It is probably the most common spruce planted in Nebraska since it is easily furnished by the nurserymen, and it is easily transplanted. It is a fine tree for ornamental planting and for shelter-belts and wind-breaks, it grows rapidly for a conifer, but is short-lived in America. The graceful, drooping habit is particularly pleasing in large trees grown in the open.

Remarks: Another spruce has been planted quite commonly in Nebraska and elsewhere and that is the native American blue spruce, *Picea parryana* Sarg., which grows naturally in the mountains of Colorado, Wyoming and Utah, at elevations between 6500 and 10,000 feet. This tree may be readily distinguished from our other common spruces by means of the rigid, spine-tipped leaves which are often silvery-white or very light blue when young, later becoming deep, dull, blue-green. Tufts of such leaves are very effective and distinctive, and one needs only to run one's hand against the foliage to be sure of the identity of the tree. Most spruces may be told from their close relatives, the firs, by the usually, very rough twigs and the 4-angled leaves of the former.

WHITE SPRUCE



1. Winter branchlet, x 1.
2. Leaves, x 1.
3. Cross-section of leaf, enlarged.
4. Unopened cone, x 1.
5. Partly open cone, x 1.
6. Cone-scale with seeds, x 1.

(From Otis: Mich. Trees)

WHITE SPRUCE
Picea canadensis (Mill.) BSP.

The Pine Family

PINACEAE

Habit and Habitat: A medium-sized tree, usually 50-60 feet high, sometimes 150 feet, with a trunk diameter of 1-2 feet or occasionally 3-4 feet; the long, comparatively thick branches, clothed with stout rigid laterals form a broad-based, rather open, pyramidal crown. Prefers low, damp woods, banks of streams, borders of lakes, and high rocky or sandy slopes; adapts itself to variable conditions.

Leaves and Buds: Leaves spirally arranged, but crowded on the upper side of the twigs by the twisting of the bases of the leaves on the under side, 4-sided or angled, awl-shaped, curved, terminating in rigid, callous tips, pale blue and hoary when they first appear, becoming dark blue-green, $\frac{1}{2}$ - $\frac{3}{4}$ inch long, ill-smelling when bruised, persistent for several years. Winter-buds broadly ovate, obtuse, covered by light, chestnut-brown scales, $\frac{1}{8}$ - $\frac{1}{4}$ inch long.

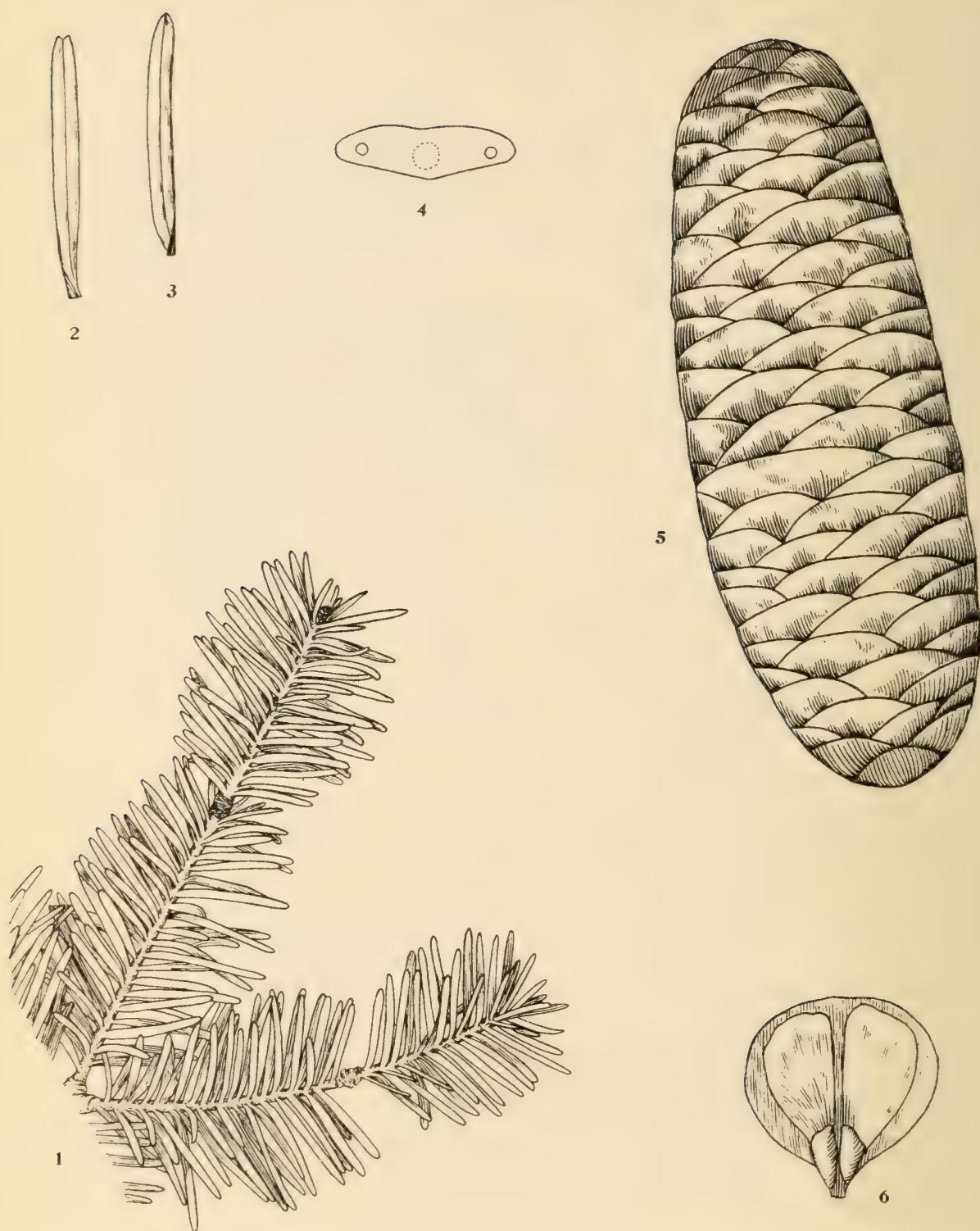
Flowers and Fruits: Flowers borne in cones late in April or in May. Staminate cones oblong-cylindrical, long-stalked, $\frac{1}{2}$ - $\frac{3}{4}$ inch long, composed of many spirally arranged, red flowers becoming yellow as the pollen is shed. Pistillate cone oblong-cylindrical, composed of many, round, nearly entire, red or pale green scales which are broader than long, associated with orbicular bracts. Fruit a leathery cone, oblong-cylindrical, slender, slightly narrowed towards each end, usually about 2 inches long, sometimes less, pale brown and shiny, with thin flexible scales; seeds about $\frac{1}{8}$ inch long, with large wings which are oblique at the apex. Fruit ripening in the autumn or early winter of the first season.

Bark, Twigs and Wood: Bark of twigs smooth, gray-green, becoming orange-brown, finally dark grayish-brown; thin, light gray-brown on the trunk and separating irregularly into thin, plate-like, grayish-brown or reddish scales. The wood is light, soft, not strong, straight-grained, light yellow with scarcely distinguishable sapwood; manufactured into lumber in the eastern Canadian provinces and in Alaska, and used in construction, for interior trim, paper pulp, baseball bats, flooring, casks, lime and cement barrels, butter tubs and pails, excelsior and charcoal.

Distribution in the State: White spruce does not grow naturally in Nebraska but is very commonly planted in the state. This species has a remarkably wide distribution, extending from Newfoundland and Labrador on the Atlantic coast westward entirely across Canada and to the shores of the ocean in Alaska. It is found upon the most northerly border of the great transcontinental, coniferous forest of Canada. Also in the Black Hills.

Remarks: The weather never gets too cold for white spruce, but the climate may be too dry for it. however, it is one of the best spruces for planting in this state, generally slow of growth but forming a beautiful conical tree. It should always be planted in as moist and cool site as is possible to be found. The white spruce is most conspicuous in Nebraska during the Christmas season since it is very widely used for Christmas trees and other holiday decoration.

BALSAM FIR



1. Winter branchlet, x 1.
- 2-3. Leaves, x 2.
4. Cross-section of leaf, enlarged.
5. Unopened cone, x 1.
6. Cone-scale with seeds, x 1.

(From Otis: Mich. Trees)

BALSAM FIR
Abies balsamea (L.) Mill.
The Pine Family
PINACEAE

Habit and Habitat: A medium-sized, slender tree, 40-60 feet high, with a trunk diameter of 12-18 inches, or rarely of 30 inches; branches in whorls of 4-6, forming a symmetrical, open, pyramidal crown; lower branches soon dying when trees are crowded. Prefers cool, rich, moist soil; common in low swampy sites and well-drained hillsides.

Leaves and Buds: Leaves needle-like, scattered or arranged spirally on the twigs, on young trees at right-angles to the branch, on old trees inclined to cover the upper side of the twigs, apex acute or rounded, $\frac{1}{2}$ - $1\frac{1}{4}$ inch long, shiny, dark green above, pale or silvery-white beneath, aromatic, persisting 8-10 years. Winter-buds globose, orange-green, very resinous, $\frac{1}{8}$ - $\frac{1}{4}$ inch in diameter.

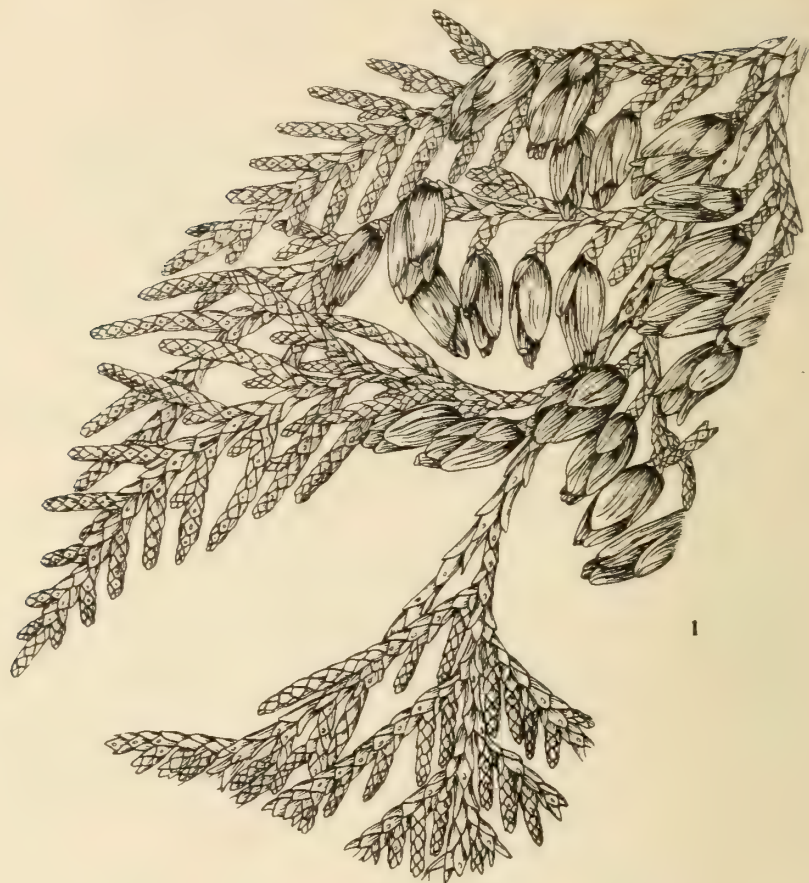
Flowers and Fruits: Flowers in cones, May; staminate cones oblong-cylindrical, yellow, more or less tinged with purple, $\frac{1}{4}$ inch long, composed of scales and yellow stamens arranged spirally about the axis; pistillate cones oblong-cylindrical, 1 inch long, composed of nearly orbicular, purple scales and yellowish-green bracts spirally arranged about the central axis. Fruit an erect, oblong-cylindrical cone, gradually narrowed to the rounded apex, 2-4 inches long, about 1 inch thick, hairy, with scales about as broad as long with rounded border; seeds about $\frac{1}{4}$ inch long, and shorter than the light brown wings. Cones ripening at the close of the first season and completely disintegrating, that is, the scales and seeds all falling away from the cone axis leaving the latter upon the twigs for many years.

Bark, Twigs and Wood: Twigs at first grayish and hairy, becoming grayish-brown and smooth; thin and smooth on young trunks, pale, gray and marked by numerous, swollen balsam blisters; bark reddish-brown on old trunks and much broken on the surface into small plates covered with scales. The wood is light, soft, not strong, coarse-grained, perishable, pale brown, with thick, lighter colored sapwood; of little value for lumber, but is used for lath, shingles, boxes and crates, and for wood pulp used in paper manufacture.

Distribution in the State: Balsam fir does not occur naturally in Nebraska but is quite commonly planted as an ornamental, being substituted sometimes unknowingly for spruce for such purposes. Common in northern United States to northeastern Iowa and abundant in eastern and central Canada.

Remarks: Balsam fir produces its resin or turpentine not in ducts scattered through the wood as do the pines, but in superficial blisters in the bark. These blisters are often a half inch in diameter. They contain a limpid, aromatic fluid which runs out when the blister is broken and is used in considerable quantities in the biological sciences and in medicine. Another fir tree that is commonly planted in this state is the silver fir, *Abies concolor*, of the Rocky Mountains and westward. The pale blue or grayish leaves, which are 2-3 inches long, will serve to help to distinguish this tree from the eastern balsam fir. In general the firs may be distinguished from the spruces (with which many people confuse them) by the flattish leaves, smooth twigs from which the leaves have fallen, and erect cones. Spruce leaves are 4-sided, the twigs are very rough after the leaves fall, and the cones are pendulous.

ARBOR VITAE. WHITE CEDAR



1. Fruiting branchlet, x 1.
2. Tip of branchlet, enlarged.
3. Cone-scale with seeds, x 3.

(From Otis: Mich. Trees)

ARBOR VITAE. WHITE CEDAR

Thuja occidentalis L.

The Pine Family

PINACEAE

Habit and Habitat: A tree, 40-60 feet tall, with a short, often broadly buttressed trunk 1-2 feet in diameter, sometimes 6 feet in diameter, often divided into 2-5 stout, secondary trunks; the short, horizontal or ascending branches turn upward and form a rather narrow, compact, pyramidal crown, or a narrow-conical or cylindrical crown in certain varieties. Prefers very moist soil in swamps and along stream courses, often forming nearly impenetrable forests in such places.

Leaves and Buds: Leaves opposite, in 4 vertical rows, scale-like, flattened, ovate, obtuse, or pointed, about $\frac{1}{4}$ inch long, keeled in the side pairs, flattened in the others, yellow-green, often becoming brownish in winter, strongly aromatic when bruised, remaining in position 1-2 years; twigs often flattened, fan-like; buds minute, naked.

Flowers and Fruits: The flowers are produced in small cones which appear in April or May. Staminate cones very tiny, globular, yellow, composed of 4-6 stamens arranged about the central axis, often produced in great numbers. Pistillate cones also tiny, oblong, reddish, composed of 8-12 scales arranged oppositely about a short axis. Fruit an erect, short-stalked, oblong-ovoid, pale brown, woody or leathery cone about $\frac{1}{2}$ inch long, composed of 8-12 loose scales; scales thin, leathery; seeds few, usually 2, $\frac{1}{4}$ inch long, ovate, acute, surrounded by a narrow, yellowish-brown, membranous wing. Cones ripening and discharging the seeds in early autumn of the first season.

Bark, Twigs and Wood: Bark on twigs yellow-green, later reddish, finally smooth, shiny, dark orange-brown or cinnamon-red, light reddish-brown on the trunk, often tinged with orange color, $\frac{1}{4}$ - $\frac{1}{2}$ inch thick, broken by shallow fissures into narrow, flat, connected ridges, the surface of which becomes separated into elongated, ragged persistent or deciduous scales. The wood is light, soft, brittle, rather coarse grained, often spirally-grained, durable, pale yellow-brown, with thin, whitish sapwood, fragrant; largely used for telegraph poles and cross-arms for the same, fence posts, shingles, paving blocks, railway ties, siding for light boats, also for tubs, pails, tanks and churns.

Distribution in the State: Arbor vitae does not grow naturally in Nebraska, northeastern Iowa being its closest natural approach to our state. It is common throughout northeastern United States and southeastern Canada and along the Appalachian mountains to northern Georgia.

Remarks: The arbor vitae has been quite commonly planted in eastern Nebraska as an ornamental and occasionally as a hedge or wind-break. It is a very good plant for hedge purposes since it may be trimmed to form a flat compact top; it is best, however as a screen or rather high hedge or when grown singly or in company with the red cedar to produce a thick bank of green. When planted in Nebraska it is well to water the tree thoroughly during dry periods.

RED CEDAR RED JUNIPER



1. Branchlet with awl-shaped leaves, x 1.
2. Tip of branchlet, showing awl-shaped leaves, enlarged.
3. Fruiting branchlet with scale-like leaves, x 1.
4. Tip of branchlet, showing scale-like leaves, enlarged.

(From Otis: Mich. Trees)

RED CEDAR. RED JUNIPER

Juniperus virginiana L.

The Pine Family

PINACEAE

Habit and Habitat: A tree, occasionally 100 feet high, with a trunk diameter of 3-4 feet, but more commonly 30-40 feet high and 1-2 feet in diameter; the short, slender, horizontal and ascending branches forming a narrow, compact, regular or irregular, pyramidal or rounded crown. Found commonly upon dry gravelly slopes and limestone ridges, but prefers loamy soil and sunny slopes; also seen about lakes and along streams.

Leaves and Buds: Leaves in opposite pairs, of two kinds; scale-like, closely appressed, over-lapping, ovate acute, $\frac{1}{8}$ inch long, forming smooth, slender, angular twigs, or awl-shaped, $\frac{1}{2}$ - $\frac{3}{4}$ inch long, loosely-arranged, forming prickly twigs; often both kinds on the same tree, occasionally all leaves upon the tree of one or the other kind exclusively; spicy when bruised; dark bluish-green, or whitish, turning russet or yellow-brown or purple during the winter, persistent for 5-6 years. The buds are very tiny, without scales.

Flowers and Fruits: Flowers produced in May or June; staminate in the form of tiny, oblong cones, composed of 8-12 shield-like scales, each bearing 4-5 yellow, globose pollen sacs; the pistillate cones or "flowers" tiny, ovoid, composed of 3 pairs of fleshy, bluish or purplish scales united at the base, at the ends of short twigs or in the axils of the leaves. Fruit a globular, berry-like cone or "juniper berry", about $\frac{1}{4}$ inch in diameter, dark blue or purple with a whitish covering like a blue plum, with thin, sweet, resinous flesh and 2-3 bony seeds, ripening at the close of the first season.

Bark, Twigs and Wood: Bark light brown, tinged with red and separated into long narrow scales which persist for many years; bark on the twigs greenish to reddish-brown and smooth, becoming thin and light reddish-brown on the branches and trunk. The wood is light, soft, close-grained, brittle, not strong, very durable, very fragrant when freshly cut, dull red with thin whitish sapwood, easily worked; largely used for posts, poles, interior trim, clothes chests and closets, pails, tubs, brushes, and is almost the only wood used in the manufacture of lead pencils.

Distribution in the State: This is one of the three native Nebraska coniferous trees, it being found scattered widely over the eastern half of the state, this being the western limit of the species which is more common throughout eastern United States except in the extreme north and in southern Florida, covering considerable areas in Mississippi and Alabama with nearly pure forests of bushy trees. Map 2.

Remarks: The red cedar is one of the most valuable trees of the United States because of the value of the wood and the uses of the species for landscape decoration. It makes an excellent low wind-break and it endures close pruning without injury, often being pruned into fantastic forms. Care should be taken that this tree is not planted near the apple orchard because of the fact that a certain rust fungus disease alternates between this tree and the apple tree which often does great damage to the apple. The tree is very hardy in our region and it should be planted more widely as an ornamental. The western red cedar, *J. scopulorum*, is a very similar but less important tree which has come into Nebraska from the Rocky Mountains and has worked eastward about half way across the state. Map 3.

ALMOND-LEAF WILLOW



1. Winter twig, x 1.
2. Lateral bud, enlarged.
3. Leaf, x 1.
4. Staminate flowering branchlet, x $\frac{1}{2}$.
5. Staminate flower, enlarged.
6. Pistillate flowering branchlet, x $\frac{1}{2}$.
7. Pistillate flower, enlarged.
8. Fruiting branchlet, x $\frac{1}{2}$.

(From Otis: Mich. Trees)

ALMOND-LEAF WILLOW
Salix amygdaloides Anderss.

The Willow Family
SALICACEAE

Habit and Habitat: A tree, 20-40 feet high or taller in the east, with a straight, columnar trunk, 12-20 inches in diameter; straight, ascending, tough branches form a rather narrow, rounded or spreading, open crown. Prefers the borders of ponds and lakes and banks of streams along which it ranges entirely across the continent, being less abundant in the far east than elsewhere.

Leaves and Buds: The leaves are alternate, simple, 2-5 inches long, $\frac{3}{4}$ -1 $\frac{1}{4}$ inch wide, lanceolate to ovate-lanceolate, wedge-shaped or rounded at the base, long-pointed, finely serrate, thin, but firm, when full grown light green and shiny above, pale and whitish beneath, petioles slender, $\frac{1}{2}$ - $\frac{3}{4}$ inch long. Winter buds broadly ovoid, baggy, or swollen on one side, shiny, dark brown, $\frac{1}{8}$ inch long.

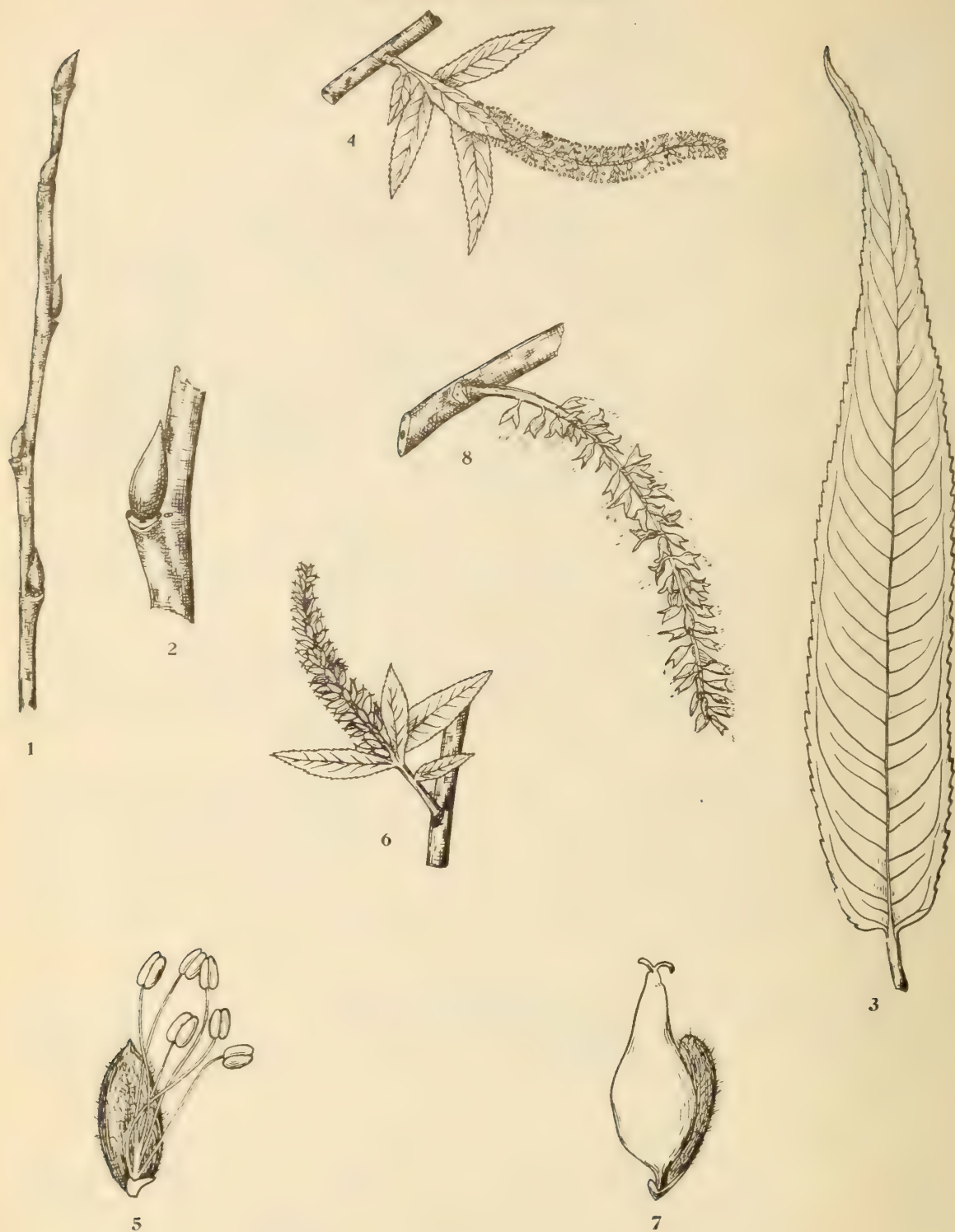
Flowers and Fruits: Flowers produced in April or May, borne in densely crowded, slender, cylindrical, hairy catkins 2-3 inches long, calyx and corolla 0, each flower subtended by an oval, yellow, silky bract or scale; stamens 5-9, ovary oblong-conical, about $\frac{1}{8}$ inch long. Fruit ripening in May or June, clustered in open, drooping catkins, globose-conical pod or capsule, $\frac{1}{4}$ inch long, containing many minute, brownish seeds, each furnished with a tuft of long, silky, white hairs, which makes possible the blowing of the seeds for long distances.

Bark, Twigs and Wood: The bark on young twigs is smooth, shiny, dark orange or reddish-brown, becoming darker orange-brown, thick and brown on old branches and the main trunk, and irregularly fissured into flat, more or less connected ridges. The wood is light, soft, weak, close-grained, light brown, with thick, almost white sapwood; used locally for fuel or occasionally for fence posts, but the wood is not durable in contact with the soil so it is not good for posts.

Distribution in the State: This willow has a very wide range, being found in almost all parts of the country. It is seen along streams and in marshy places in all parts of our state, it being a tree whose light, hairy seeds have carried it into practically every possible section of the state. Map 5.

Remarks: It is said that this species often hybridizes naturally with other species of willows so that the characteristics became so badly mixed as to render certain identification difficult. However, the usually broader and more shining leaves will help to distinguish this species from the closely related black willow. The almond-leaf willow is not a particularly desirable ornamental tree, but in the most favorable situations it may develop into a fairly pretty tree. But like most species of willow this tree is little more than a weed among trees. When grown in quantities sufficient to be worth while the wood is quite valuable as a quick-firing and brief fire wood. The almond-leaf willow, as nearly all species of willow, may be readily propagated by "slips" or cuttings.

BLACK WILLOW



1. Winter twig, x 1.
2. Portion of twig, enlarged.
3. Leaf, x 1.
4. Staminate flowering branchlet, x 1.
5. Staminate flower, enlarged.
6. Pistillate flowering branchlet, x 1.
7. Pistillate flower, enlarged.
8. Fruiting branchlet, x 1.

(From Otis: Mich. Trees)

BLACK WILLOW
Salix nigra Marsh.

The Willow Family
SALICACEAE

Habit and Habitat: A tree, 20-40 feet tall, with a short, often bent trunk, 8-20 inches in diameter; the stout, erect and spreading branches form a broad, rounded or irregular, open crown; sometimes a low, much divided shrub. Prefers moist soil along streams or about marshes and ponds, but grows fairly well in the drier soils of parks.

Leaves and Buds: Leaves alternate, simple, 2-5 inches long, $\frac{1}{4}$ - $\frac{3}{4}$ inch broad, lanceolate, often long, taper-pointed and curved at the tip, rounded or wedge-shaped at the base, finely serrate, bright green and shiny above, pale and more or less hairy beneath, petioles short, somewhat hairy. Buds narrow-conical, acute, shiny, reddish-brown, $\frac{1}{8}$ - $\frac{1}{4}$ inch long; flower buds usually with a single bud scale.

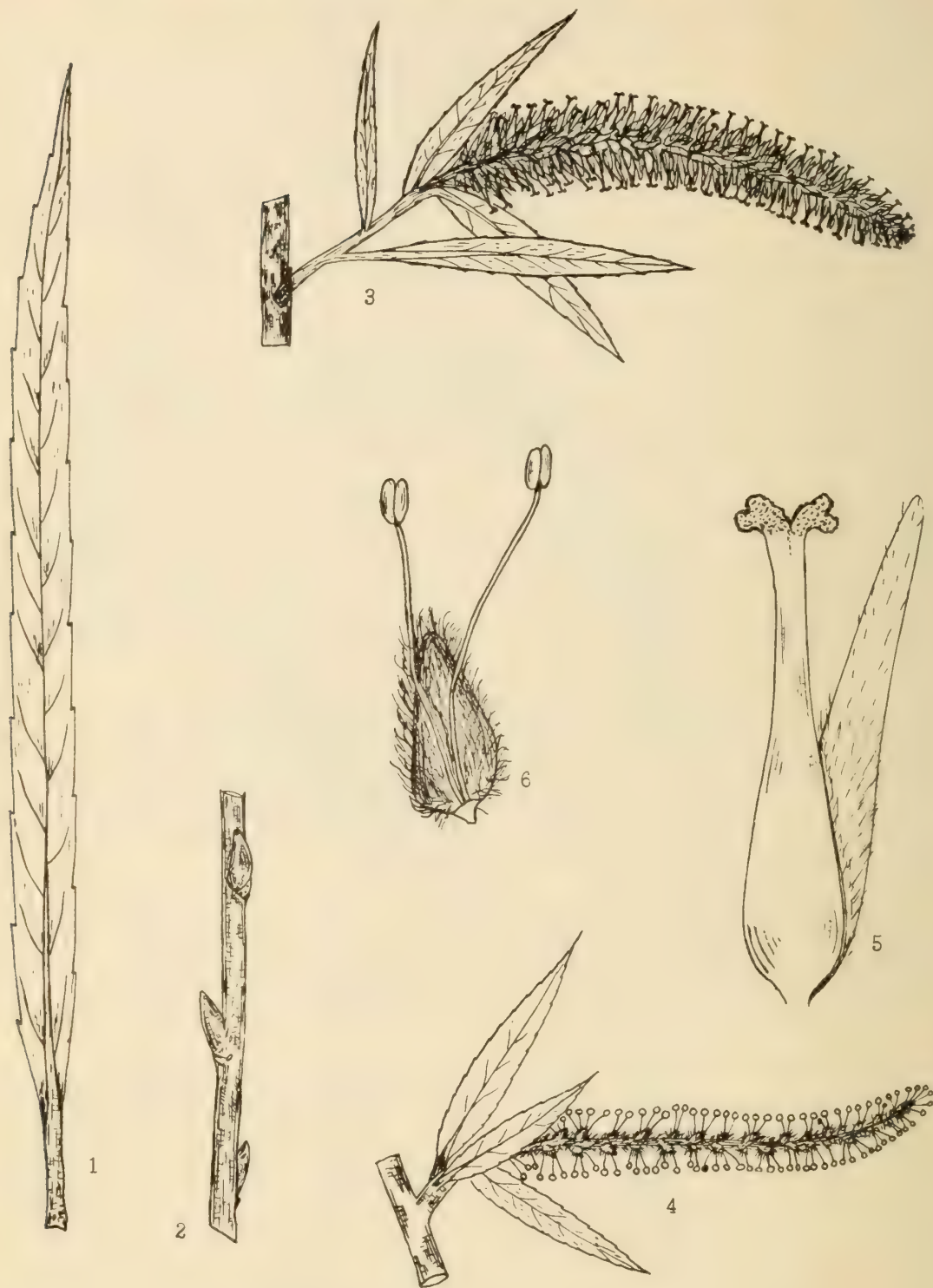
Flowers and Fruits: Flowers produced in late March, April or May, with the leaves, or before them, borne in crowded, cylindrical catkins, 1-3 inches long, calyx 0, corolla 0, flower scales yellow, silky, stamens 3-6, ovary broadly conical, short-stalked. Fruit a dry, conical pod or capsule, ripe in June, $\frac{1}{8}$ inch long, containing many tiny brown seeds each of which is furnished with a tuft of long, white, silky hairs.

Bark, Twigs and Wood: The bark is dark brown or nearly black on some trees and on old trunks, divided into broad, flat, connected ridges which often become more or less scaly or shaggy; twigs smooth or hairy, bright reddish-brown, becoming darker with age; thick and darker brown on the older branches; branches slender, brittle. Wood light reddish-brown, sapwood, nearly white, light, soft, weak, close-grained, checks badly in drying, used for fuel.

Distribution in the State: This is a common tree or shrub all over eastern United States and westward to the base of the Rocky Mountains; it also appears in California. It is found in practically all parts of the state of Nebraska wherever there is sufficient moisture in the soil for its demands as along stream courses and about lakes and ponds. Map 6.

Remarks: Willows differ greatly in size and habit of growth but otherwise they are very much alike. The toughness of the root system is sometimes utilized in the planting of these trees on the banks of streams in order that the tough interlacing roots may protect the bank against the erosive force of the water. Sometimes the roots of willows enter a break in a water main where they develop to such a degree as to nearly prevent the flow of water through the main. Willows are found in the far arctic north and also abound in the tropics. On some high mountains species of willows become so greatly dwarfed as to be only 1-2 inches high and they produce a carpet-like growth on the surface of the ground, the tree habit of growth being completely abandoned.

SANDBAR WILLOW. LONG-LEAF WILLOW



1. Leaf, x 1.
2. Winter twig, x 2.
3. Pistillate flowering branchlet, x 1.
4. Staminate flowering branchlet, x 1.
5. Pistillate flower and bract, enlarged.
6. Staminate flower and bract, enlarged.

(Original)

SANDBAR WILLOW. LONG-LEAF WILLOW

Salix fluviatilis Nutt.

The Willow Family

SALICACEAE

Habit and Habitat: A small tree, usually about 20 feet high, with a slender trunk 2-3 inches in diameter, although occasionally considerably much larger; the slender, flexible, erect branches form a narrow elongated or round-topped crown; commonly dwarfed to a shrub, 5-6 feet in height and growing in dense communities. Found on the banks of streams, the borders of lakes and swamps and especially upon the sandbars, so numerous in our broad, shallow western streams, such as the Missouri and Platte.

Leaves and Buds: Leaves alternate, simple, linear-lanceolate, often more or less curved, gradually narrowed at both ends, 2-6 inches long, $\frac{1}{8}$ - $\frac{1}{3}$ inch wide, margin with distant, shallow, grandular teeth, soft, silky when young, at maturity thin, smooth, light yellow-green, paler beneath, midrib yellow; petioles grooved, $\frac{1}{8}$ - $\frac{1}{4}$ inch long. Buds ovate, narrow, acute, chestnut-brown, about $\frac{1}{8}$ inch long.

Flowers and Fruit: Flowers produced in catkins in early summer, staminate catkins borne by short, stout stalks, cylindrical, soft, pale-silky, 1½-2 inches long, flowering scales entire, light, yellow-green, bearing 2 stamens, pistillate catkins about 1 inch long, greenish, crowded, elongating in fruit, ovary oblong, acute, short-stalked, silky. Fruit a dry capsule or pod, light brown, $\frac{1}{4}$ inch long, borne in rather crowded catkins, 2-3 inches long; seeds tiny, brownish, covered with long, silky hairs.

Bark, Twigs and Wood: Bark thin, smooth, or shallowly fissured, and more or less fine scaly, often tinged with red. The twigs are slender, flexible, smooth, gray, light yellow or dark orange or sometimes purplish red. The wood is soft and light, close-grained, more or less satiny, weak, brittle, light brown, with lighter colored or often nearly white sapwood, used slightly except for light fuel and charcoal.

Distribution in the State: The sandbar willow is found in practically all parts of Nebraska where there is sufficient moisture in the soil for its development. Its common home is upon the sandbars and islands of various ages in the Missouri and Platte rivers and their tributaries. It is found practically throughout the United States except on the Atlantic coast and goes far up into northeastern Canada. Map 4.

Remarks: The sandbar willow is the first tree or shrub in all the northern interior portion of our continent to take root upon newly formed sandbars and sandy banks of streams and lake shores. By holding the sand or mud in place by its extensive, fibrous root-system it is not only able to maintain its own hold upon such treacherous footing but it also becomes the natural fore-runner of many other plants which invade such places the easier because of the influence of this pioneer. Practically all of the islands, both great and small in the Platte river have become permanently established and eventually more or less heavily wooded because of the influence of this species. These small rod-like trees are often bound together into rip-rap work and so placed as to prevent the cutting of the river bank by the stream.

COTTONWOOD



1. Winter twig, x 1.
2. Leaf, x $\frac{1}{2}$.
3. Staminate flowering branchlet, x $\frac{1}{2}$.
4. Staminate flower, enlarged.
5. Pistillate catkin, x $\frac{1}{2}$.
6. Pistillate flower, enlarged.
7. Fruit, x $\frac{1}{2}$.

(From Otis: Mich. Trees)

COTTONWOOD
Populus deltoides Marsh.

The Willow Family
SALICACEAE

Habit and Habitat: A large tree, reaching a height of 70-100 feet and a trunk diameter of 3-6 feet; usually branching low down, when grown in the open, to form a wide-spreading, open, symmetrical crown of massive horizontal and ascending branches and stout more or less crooked branches and often angled twigs. When in the forest or in closely planted groves the straight, erect or more or less leaning, trunk is free from branches for a height of 15-30 feet. Prefers the rich, moist soils of river banks, river-bottoms and moist woodlands.

Leaves and Buds: Leaves alternate, simple, 3-5 inches long, nearly as broad, broadly deltoid-ovate, coarsely toothed above the entire flat or heart-shaped base, teeth incurved, thick and firm, shiny, more or less waxy, and dark green above, paler beneath, turning bright yellow in autumn; petioles 2-3 inches long, slender, compressed laterally, yellow or red. Terminal bud $\frac{1}{2}$ - $\frac{3}{4}$ inch long, conical, acute, very resinous, shiny, yellowish or chestnut-brown.

Flowers and Fruits: Flowers in April or May, before the leaves or as they unfold, produced in pendulous or drooping catkins; the staminate in short-stalked, densely-flowered, reddish catkins 3-5 inches long; the pistillate in short-stalked, few-flowered, upon greenish catkins, 5-7 inches long; calyx 0, corolla 0; stamens numerous, yellowish to red on brownish papery scales; ovary stout, surrounded at the base by a cup-shaped disk. Fruit a 2-4-valved, dry pod or capsule, borne in loosely arranged, pendulous catkins, 5-8 inches long; seeds numerous, light brown, densely cottony with white or slightly rusty hairs.

Bark, Twigs and Wood: Bark on old trees ashy gray, thick, deeply furrowed into broad, rounded or narrow-edged ridges, broken into scales, on young stems and branches smooth, light yellow-green or almost white, with dark splotches; young shoots often more or less zigzag and longitudinally ridged. Wood dark brown, sapwood thick, nearly white, light, soft, close-grained, not strong, warps badly in drying, difficult to season; used in the manufacture of paper pulp, cheap packing boxes and crates, poles, and stove wood.

Distribution in the State: The cottonwood is very common throughout the United States east of the Rocky Mountains, but commonest and of greatest size in the Mississippi-Missouri valley. It is very common in the Missouri and Iowa forests from which it has entered Nebraska and extended westward across the state and beyond. The species has been planted in groves and as windbreaks very commonly throughout this state. Map 7.

Remarks: This tree develops to magnificent proportions in the bottom lands along the Missouri and Platte rivers and their tributaries. The tree grows rapidly in a great variety of situations and for this reason it was a great favorite with the early settlers of this state. Cottonwood lumber is cut in considerable quantity in this state and is useful as rough dimension stuff.

BALSAM POPLAR. BALM OF GILEAD



1. Winter twig, x 1.
2. Leaf, x $\frac{3}{4}$.
3. Staminate flowering branchlet, x $\frac{1}{2}$.
4. Staminate flower, enlarged.
5. Catkin of pistillate flower, x $\frac{1}{2}$.
6. Pistillate flower, enlarged.
7. Fruit, x $\frac{1}{2}$.

(From Otis: Mich. Trees)

BALSAM POPLAR. BALM OF GILEAD

Populus balsamifera L.

The Willow Family

SALICACEAE

Habit and Habitat: A medium sized tree, 30-65 feet in height, with a trunk diameter of 1-2 feet in our state; with an erect, rather narrow, open, rounded or pyramidal crown of few slender, ascending and horizontal branches. Prefers the low, moist, and rich soil of river bottom-lands and borders of streams and swamps but in our area is found upon moist, rocky, canyon sides and in streamless canyon bottoms.

Leaves and Buds: Leaves alternate, simple, 2-5 inches long, about one-half as broad, ovate to broadly lance-shaped, finely serrate with rounded teeth, thin, glossy and firm, dark green above, paler beneath, petioles 1-1½ inches long, slender, cylindrical, smooth. Terminal bud ¾-1¼ inch long, ovoid, long-pointed, with many brownish-yellow, resinous, sticky and fragrant scales, lateral buds shorter, saturated with a yellow balsamic, sticky exudation, hence the name. Leaves turning bright yellow in autumn.

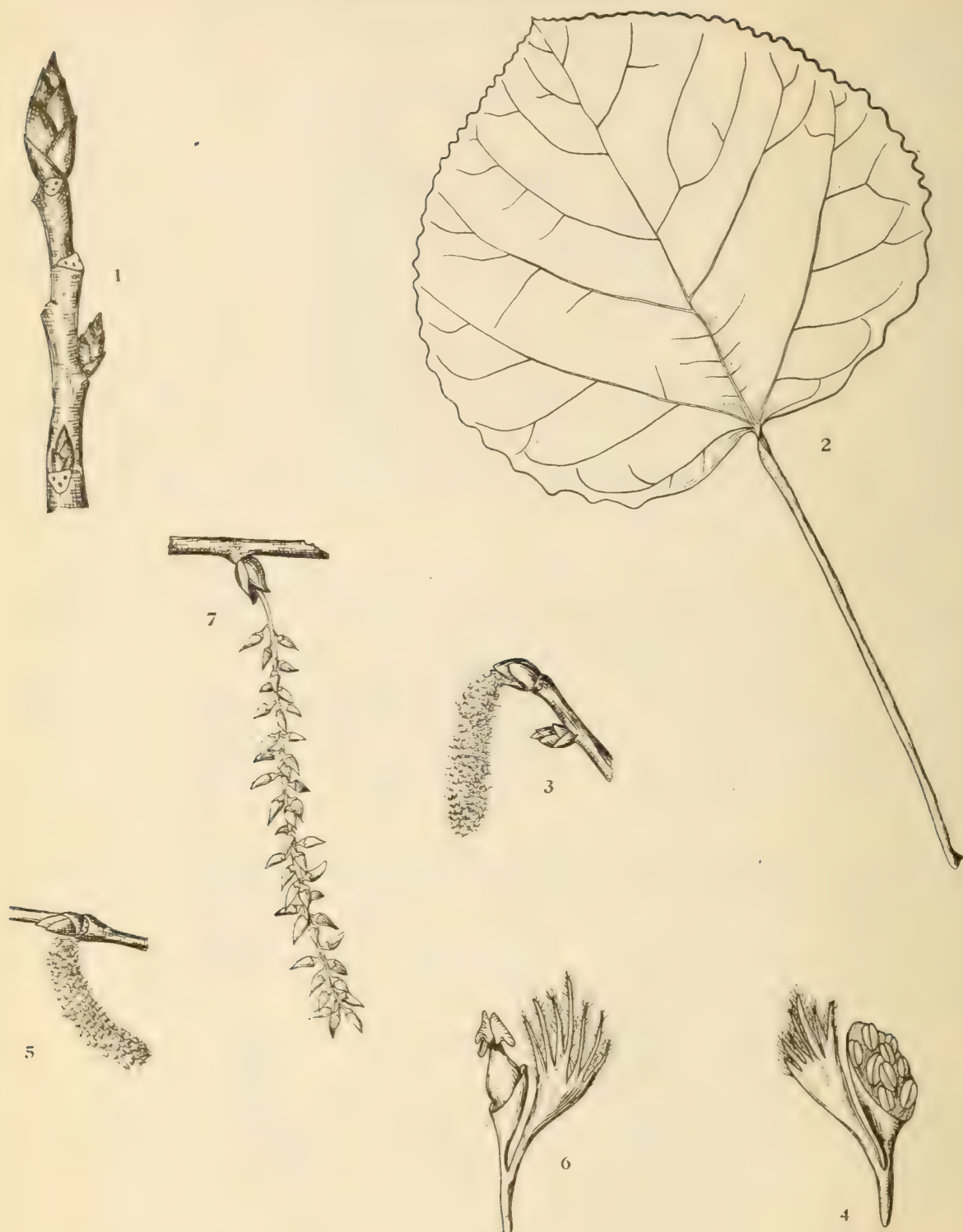
Flowers and Fruits: Flowers produced in late March or April, before the leaves, in the form of dropping catkins; staminate catkins long-stalked, 3-4 inches long; the pistillate in loosely-flowered, long-stalked drooping catkins, 4-5 inches long; calyx and corolla 0; stamens 20-30, borne upon broad fringed scales; ovary stout, with 2-lobed and wavy-margined stigmas. Fruit maturing in May, a dry, 2-valved pod, ovoid, short-stalked, ¼ inch long, borne in loose, drooping catkins, 4-6 inches long; seeds light brown, surrounded by cottony hairs which more or less completely surround the pods and serve to carry the seeds great distances from the tree.

Bark, Twigs and Wood: Bark on old trees dark brownish-gray, divided into broad rounded ridges covered with small closely appressed scales, on younger branches light brown, tinged with green or yellow and roughened by dark excrescences; twigs stout, dark reddish-brown, shiny or downy at first, becoming dark orange, finally grayish-green. Wood light brown, sapwood nearly white, weak, close-grained, light; used extensively for paper pulp.

Distribution in the State: This tree has a wonderfully wide distribution, ranging across northern Canada from Labrador to the Alaskan coast and from New England across northern United States to the Black Hills, Nevada and Oregon. It has come into Nebraska from the Black Hills and is found only in a small portion of Sioux county in the extreme northwestern corner of the state. Map 9.

Remarks: This is the largest tree of northwestern America where in the valley of the Mackenzie and upper Yukon it attains magnificent proportions, reaching a height of a hundred feet and a diameter of 6-7 feet, and forms dense forests hundreds of square miles in extent. It is often planted in the north for shelter and ornament. A variety of this tree *Populus balsamifera candicans*, is often known as the Balm of Gilead in eastern United States and is more frequently used as an ornamental tree. The leaves of this variety are much broader and are more coarsely serrate and the crown is more spreading than in *Populus balsamifera*.

QUAKING ASPEN



1. Winter twig, x 2.
2. Leaf, x 1.
3. Staminate flowering branchlet, x $\frac{1}{2}$.
4. Staminate flower, enlarged.
5. Pistillate flowering branchlet, x $\frac{1}{2}$.
6. Pistillate flower, enlarged.
7. Fruit, x $\frac{1}{2}$.

(From Otis: Mich. Trees)

QUAKING ASPEN
Populus tremuloides Michx.

The Willow Family
SALICACEAE

Habit and Habitat: A tree, varying in height from 15 to 40 feet, with a trunk diameter of 3 to 20 inches. Sometimes seen in the form of low scrubby bush. The crown is usually loose, open, and as a rule is roundish in form; the twigs are slender. The species prefers the moist, gravelly soils of canyon bottoms and north slopes, although frequently found in drier sites also.

Leaves and Buds: The leaves are alternate, simple, with long, flat petioles and broadly orbicular or roundish in outline, with numerous shallow and rounded teeth on the margin, dark green above and pale beneath, turning bright yellow or orange in the autumn, in almost constant vibration in even the slightest breeze, hence the common name. The buds are narrowly conical, pointed, reddish-brown and usually glossy, and from $\frac{1}{8}$ to $\frac{1}{4}$ inch long.

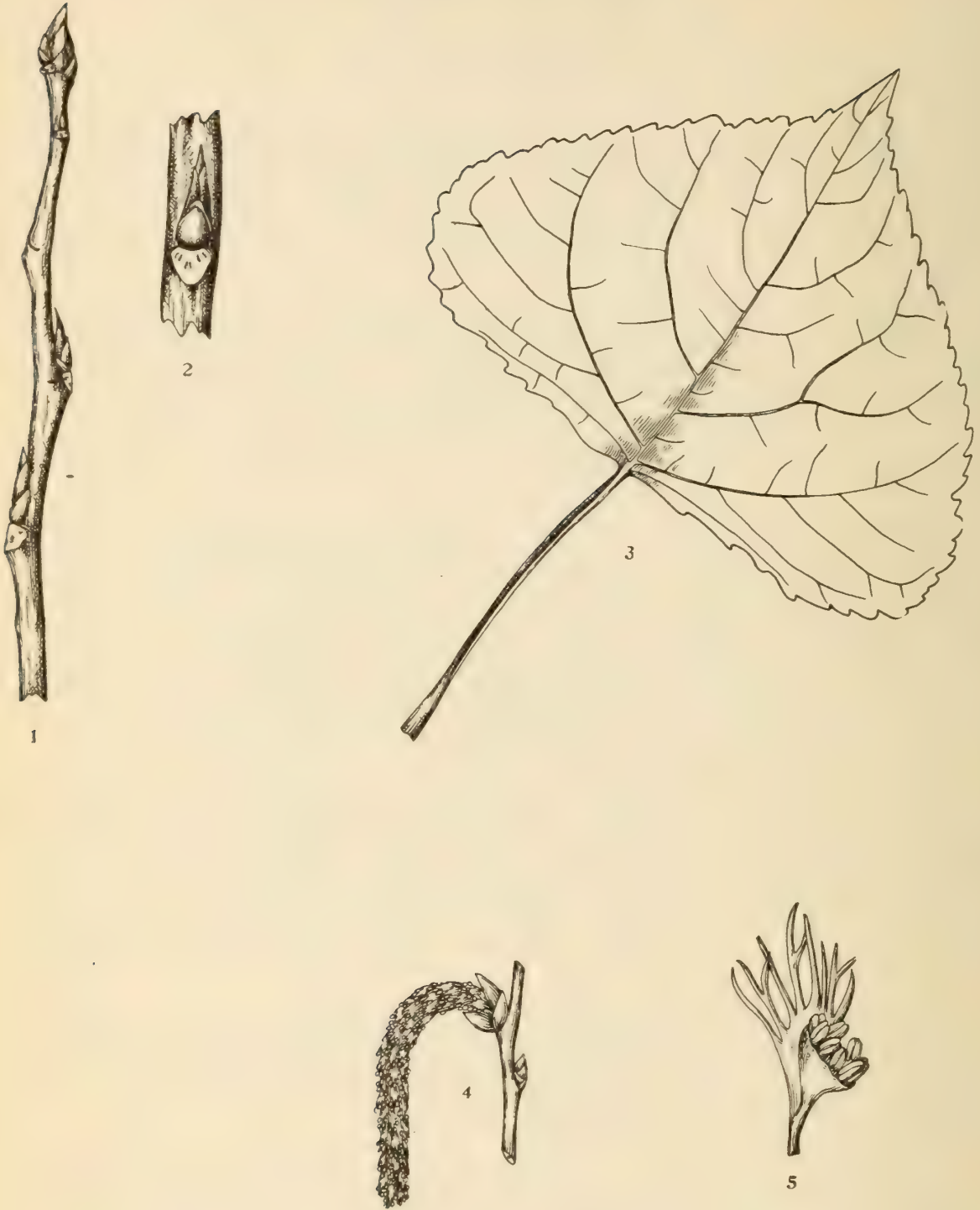
Flowers and Fruit: Flowers appearing in April as a rule, preceding the leaves, borne in catkins which emerge from the buds near the tips of the twigs. The staminate, or male, flowers are in dense catkins which are 2 to 3 inches long. The pistillate, or female, flowers are also borne in catkins of about the same size but not so dense, and are usually more or less reddish. The fruits are arranged in elongated clusters which mature in May or June. Each fruit is an oblong, short-stalked capsule about $\frac{1}{4}$ inch long which splits into two parts and bears numerous light brown seeds each with a tuft of cottony hairs.

Bark, Twigs and Wood: On the larger twigs and older branches the bark is greenish or almost white and is often more or less granular on the surface, while on the main trunk and at the base of the tree it becomes fissured and darkened in color. The bark of the younger twigs is usually smooth and shiny and more or less reddish-brown. The wood is light in weight and colored white to light brown, soft, close-grained, not durable in contact with the soil, warps badly unless carefully seasoned.

Distribution in the State: Found only in the Pine Ridge region of Sioux and Dawes counties in the northwestern corner of the state and in a few widely scattered areas in the sandhills. This is a northern tree which has barely become established in the state probably coming in via the Black Hills where it is abundant. Map 11.

Remarks: With us the quaking aspen is little more than a curiosity although it does occasionally grow to the size of fine trees in Sioux county where it might be used for fuel. The wood is not sufficiently durable in contact with the soil to warrant its use for posts or poles. If produced in quantity it might be used in rough construction. The quaking aspen is a close relative of our common cottonwood but it is not nearly so desirable a tree for planting in Nebraska. It is frequently seen in public parks.

LOMBARDY POPLAR



1. Winter twig, x 1.
2. Portion of twig, enlarged.
3. Leaf, x $\frac{3}{4}$.
4. Staminate flowering branchlet, x $\frac{1}{2}$.
5. Staminate flower, enlarged.

(From Otis: Mich. Trees)

LOMBARDY POPLAR
Populus nigra italica Du Roi

The Willow Family
SALICACEAE

Habit and Habitat: A large tree, 60-100 feet tall, with a short, ridged, ribbed and buttressed trunk, 4-6 feet in diameter, and a narrow, compact, spire-like or narrowly conical crown of myriads of erect branches and twigs. Prefers rich, moist soils, as most of the poplars, but like them it is also grown under a great variety of conditions. The poplars are readily adapted to different environmental conditions.

Leaves and Buds: Leaves alternate, simple, 2-3½ inches long, often somewhat broader than long, broadly deltoid, abruptly pointed at the tip, straight across the base, finely and bluntly toothed or serrate, thick and firm, more or less leathery, dark green and shiny above, paler beneath, turning rich, golden yellow in autumn; petioles slender, 1-2 inches long, flattened. Terminal bud conical, angular, pointed, more or less sticky, ¼-¾ inch long; lateral buds smaller, closely pressed against the twigs.

Flowers and Fruits: Flowers produced in April or May, before the leaves, both kinds in catkins; the staminate in stalkless, cylindrical, dark red catkins, 3 inches long; pistillate catkins not produced in the United States; calyx and corolla 0; stamens 7-10, purplish. Fruit a capsule or pod more or less like that of the other poplars, but not produced in the United State because of the fact that the female or pistillate flowers are not produced here.

Bark, Twigs and Wood: The bark on old trees is thick, grayish brown or almost black, on the main trunk, deeply and irregularly furrowed, the twigs are smooth, shiny, at first yellow, becoming gray or brownish. The wood is light brown, with thick nearly white sapwood, light, soft, toughish, weak, not durable; used somewhat for the manufacture of cheap boxes and wooden ware.

Distribution in the State: Planted occasionally as an ornamental along fence rows and in parks and gardens. In early times this tree was cultivated in western Asia from which it was introduced into Europe. It is thought to be a native of Afghanistan where it is said to grow wild at an altitude of 7500 feet. It has been said that the Lombardy poplar was the first ornamental tree to be introduced into the United States.

Remarks: The Lombardy poplar is a rapidly growing tree and can be used to produce a narrow, leafy wall sooner and more satisfactorily than any other tree. When planted by the roadside it does not shade the street because of the narrow, spire-like crown. The tree is rather short-lived and because of the crowded nature of the limbs and twigs many of these die and remain upon the tree to produce a rather unsightly, bushy appearance. The tree when used in abundance in a landscape plan produces a particularly striking and pleasing effect as seen, for instance, in Salt Lake City and generally in Salt Lake valley. A tall, stately row of such trees on each side of a broad street produces a very impressive effect. The tall conical mass of foliage of the Lombardy becomes especially striking and pleasing when contrasted with round-headed trees, or when used to break up any extensive horizontal lines in a plan of landscaping.

WHITE POPLAR ABELE-TREE



1. Winter twig, x 1.
2. Portion of twig, enlarged.
3. Leaf, x 2.
4. Staminate flowering branchlet, x $\frac{1}{2}$.
5. Staminate flower, enlarged.
6. Pistillate flowering branchlet, x $\frac{1}{2}$.
7. Pistillate flower, enlarged.
8. Fruit, x $\frac{1}{2}$.

(From Otis: Mich. Trees)

WHITE POPLAR. ABELE-TREE

Populus alba L.

The Willow Family

SALICACEAE

Habit and Habitat: A large tree, 60-80 feet tall, with a trunk diameter of 2-3 feet, forming a large, spreading, rounded or pyramidal crown of large branches and many stout twigs; crown often tangled because of crooked branches. Prefers rich, moist soils in which it grows rapidly, but also thrives in poor soil. The roots penetrate deeply and often produce many suckers or sprouts for several feet surrounding the tree.

Leaves and Buds: Leaves alternate, simple, 2-4 inches long, and about the same in width, broadly ovate or rounded, irregularly toothed or wavy-margined, sometimes deeply 3-5-lobed, smooth and dark green above, white-woolly beneath; petioles long, slender, flattened, hairy. Winter-buds ovoid, pointed, downy, not viscid or resinous, about $\frac{1}{4}$ inch long.

Flowers and Fruits: Flowers appearing in April or May, before the leaves, in catkins; staminate catkins thick, 2-4 inches long, yellowish-green; pistillate catkins slender, pendulous, 1-2 inches long; calyx and corolla 0; stamens 6-16 on each scale, purplish; ovary thick, stout. Fruit a stout, 2-valved pod or capsule, $\frac{1}{8}$ - $\frac{1}{4}$ inch long, borne in drooping catkins; seeds light brown, surrounded by long, white hairs, as in the other poplars.

Bark, Twigs and Wood: Bark on twigs greenish and covered with a whitish down, becoming greenish-gray and splotted with darker spots, dark bluish-green on older branches, dark gray or almost black on the main trunk and deeply fissured to form irregular longitudinal ridges. Wood light, soft, weak, reddish-yellow, with thick, white sapwood, difficult to split, warps badly; used slightly except for fuel.

Distribution in the State: This poplar is a native of Europe and Asia from which it has been introduced into nearly all parts of the world. It has been planted rather widely in Nebraska as an ornamental for which purpose it is well fitted. The English name of the tree is derived from the Dutch name, Abeel. It is thought that the tree was introduced into England by way of Holland.

Remarks: The white poplar is often confused with the silver maple, in fact is often called silver maple. I suppose that this is due to the deeply lobed leaves sometimes seen on this species and which do resemble somewhat those of our common silver or soft maple. But the resemblance is slight and superficial for while the under side of the silver maple leaf is more or less silvery, in the white poplar the under surface of the leaves is covered with a thick, downy coat of silky hairs which is never true for the maple. And then the buds and leaves of the silver maple are always opposite, and the bark usually more or less pinkish while in the white poplar the buds and leaves are always alternate and the bark greenish. The foliage effect of this tree produced by smooth, dark green and shiny upper surfaces of the leaves and the snowy whiteness of the under surfaces is especially marked and beautiful. This mingling of green and white makes the species a very effective ornamental and one which should be more widely used in this state.

RYDBERG'S COTTONWOOD



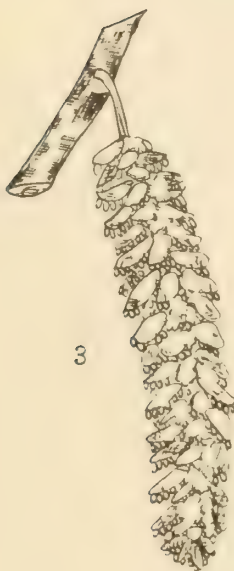
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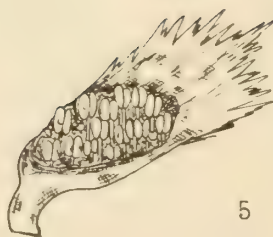
4



2



3



5



6

1. Winter twig, x 1.
 2. Leaf, x 1.
 3. Staminate catkin, x 1.
 4. Young fruiting catkin, x 1.
 5. Staminate flower, enlarged.
 6. Pistillate flower, enlarged.
- (Original)

RYDBERG'S COTTONWOOD

Populus acuminata Rydb.

The Willow Family

SALICACEAE

Habit and Habitat: A medium-sized tree, usually about 40 feet high, with a trunk 10-18 inches in diameter, with several stout, ascending branches which form a compact, round-topped or oval crown. Prefers the moist soil of stream banks but is often planted as a shade-tree on the Great Plains and in the cities and towns of the Rocky Mountain region.

Leaves and Buds: The leaves are simple, alternate, rhombic-lanceolate, abruptly acuminate, gradually or abruptly narrowed and more or less wedge-shaped at the base, or rarely broad and rounded at the base, coarsely serrate except near the apex, dark green and shiny above, dull green beneath, 2-4 inches long, $\frac{3}{4}$ -2 inches wide, midrib yellow, petioles slender, 1-3 inches long. Winter-buds acuminate, resinous, $\frac{1}{2}$ inch long, with 6-7 light, chestnut-brown, shiny scales.

Flowers and Fruits: Flowers produced in April or May, in long, slender catkins; staminate catkins 2-3 inches long, greenish, bracts numerous, wide, bearing many short dark red stamens; pistillate catkins 4-5 inches long at maturity, pendulous, green, disk cup-shaped; ovary broadly ovate, gradually narrowed above, with large deeply lobed and fringed stigmas. Fruit a dry, leathery capsule or pod, splitting from the apex, borne upon a short stalk, in loosely-fruited pendulous catkins, oblong-ovate, acute, thin-walled, slightly pitted, about $\frac{1}{3}$ inch long, 2-3 valved; seeds oblong or ovate, rounded at the tip, light brown, with a tuft of long silky hairs.

Bark, Twigs and Wood: The bark on young stems and large branches is smooth, nearly white or straw colored, becoming on old trunks pale grayish-brown, and deeply furrowed into broad flat ridges, about $\frac{1}{2}$ inch thick. The wood is light brown, with thin nearly white or greenish sapwood, close-grained, tough, weak, not durable; used for fuel, and locally for fence posts.

Distribution in the State: This is an interesting example of a tree which is very common in the Rocky Mountains but which has just reached the western border of Nebraska where it is sparingly found in the rough country of Scottsbluff county. The species finds in the canyons and valleys of these particular regions conditions which are very similar to those which it enjoys farther westward. Map 10.

Remarks: This species is called "Rydberg's cottonwood" after Dr. P. A. Rydberg who discovered it and who first gave it the name which has been accepted by all botanists for this particular tree. Doctor Rydberg was an instructor in Luther Academy, Wahoo, Nebraska, at the time he discovered this species in the early nineties. He has been for many years an authority on the flora of Nebraska and has also studied and published much upon the flora of the Rocky Mountains. He is at present, as he has been for many years, a curator in the New York Botanical Garden where he continues his studies of the flowering plants of North America. Rydberg's cottonwood is worthy of wide trial as an ornamental tree for western Nebraska.

NARROW-LEAVED COTTONWOOD



- 1 Winter twig, x 1.
2. Leaf, x 1.
3. Staminate catkin, x 1.
4. Staminate flower, enlarged.
5. Pistillate flower, enlarged.
6. Young fruiting catkin, x ½.

(Original)

NARROW-LEAVED COTTONWOOD

Populus angustifolia James

The Willow Family

SALICACEAE

Habit and Habitat: A slender, medium sized tree, 40-60 feet tall, with a trunk diameter of 8-18 inches, the slender, erect or ascending branches forming a narrow, pyramidal, oval or irregular crown, sometimes more or less bushy. Prefers the moist soil of stream banks and deep canyons, but will grow well in almost any kind of soil if there is a sufficient water supply.

Leaves and Buds: Leaves alternate, simple, lanceolate, ovate-lanceolate or rarely obovate, 2-3 inches long, $\frac{1}{2}$ -1 inch wide, narrowed to a long, tapering, acute or rounded apex, gradually narrowed, and wedge-shaped at the base, finely serrate, thin but firm, bright yellow-green above, smooth or occasionally finely-hairy beneath, leaves on rapidly growing shoots or sprouts are sometimes coarsely serrate, 6-7 inches long and 1-1 $\frac{1}{2}$ inches wide; petiole slender, flattened somewhat on the upper side. Buds very resinous and sticky, ovate, long-pointed, scales 5-7, thin, concave, chestnut-brown, terminal bud $\frac{1}{4}$ - $\frac{1}{2}$ inch long, lateral buds about one-half as long.

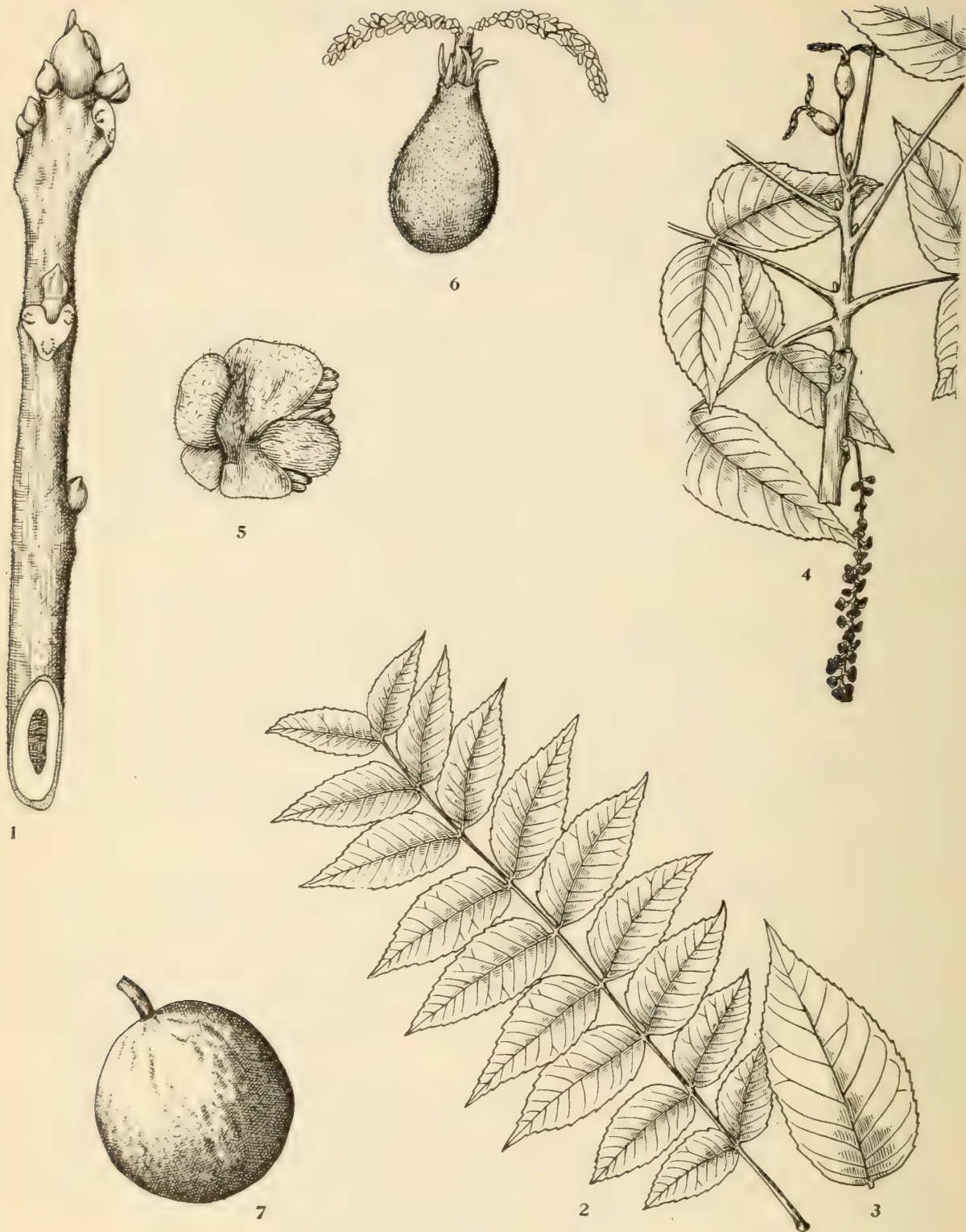
Flowers and Fruits: Flowers produced in catkins, both the staminate and pistillate catkins densely flowered, smooth, 1 $\frac{1}{2}$ -2 $\frac{1}{2}$ inches long, short-stalked, the pistillate becoming 2 $\frac{1}{4}$ -4 inches long in fruit, their scales broadly obovate, smooth, thin, papery, light brown, deeply cut into many reddish-brown, hair-like lobes, staminate flowers borne in cup-shaped, short-stalked receptacles; stamens 12-20, red; ovary ovate, more or less 2-lobed, with a short style and 2, irregularly lobed stigmas. Fruit a dry, broadly ovate pod or capsule, short-pointed, thin-walled, with a stalk about $\frac{1}{3}$ inch long; seeds ovate or obovate, light brown, $\frac{1}{8}$ inch long.

Bark, Twigs and Wood: Young branches and twigs smooth or rarely finely-hairy, marked by pale specks, at first pale yellowish-green, becoming bright or dark orange-colored in their first winter, finally pale yellow and gray. Bark $\frac{3}{4}$ -1 $\frac{1}{2}$ inches thick, light yellow-green or gray at the base, on old trees becoming divided by shallow fissures into broad, flat ridges, but smooth and much thinner above the older base. Wood light brown, with thin, nearly white sapwood, light, tough, weak, warps badly.

Distribution in the State: The narrow-leaf cottonwood is a native of western United States where it is found throughout a wide range at 5,000-10,000 altitude from Canada to New Mexico and Arizona. The tree has worked its way eastward until it has barely entered Nebraska in two places, namely, in Sioux and Scottsbluff counties, but is not abundant in either of these two localities. Map 8.

Remarks: This is the common cottonwood of northern Colorado, Wyoming, southern Montana and Utah where it is seen in abundance along mountain streams and where it is frequently planted as our common cottonwood is planted in this state. The very narrow leaves of this species of cottonwood cause some people to call it a willow, but the numerous bud scales as well as the details of the flower structure serve to separate the two types very readily.

BLACK WALNUT



1. Winter twig, x 1.
2. Leaf, x $\frac{1}{6}$.
3. Leaflet, x $\frac{1}{2}$.
4. Flowering branchlet, x $\frac{1}{2}$.
5. Staminate flower, back view, enlarged.
6. Pistillate flower, enlarged.
7. Fruit, x $\frac{1}{2}$.

(From Otis: Mich. Trees)

BLACK WALNUT

Juglans nigra L.

The Walnut Family

JUGLANDACEAE

Habit and Habitat: A large forest tree, reaching a height of 100 feet, although more commonly 40-60 feet high, with a massive trunk 2-4 feet in diameter, rooted deeply; the open, often wide-spreading crown is formed of numerous heavy branches and coarse, clumsy twigs; the trunk often clear of branches for 10-20 feet above the ground. Prefers the rich, moist soils of river bottom-lands and forested hillsides.

Leaves and Buds: Leaves alternate, compound, 1-2 feet long, unequally pinnate. Leaflets 15-23, the terminal one often missing, 2-4 inches long, about one-half as broad, ovate to lanceolate, taper-pointed, sharply serrate, thin, yellow-green and smooth above, paler and hairy beneath. Petioles stout, hairy. Leaves aromatic when bruised, turning bright yellow and falling early in the autumn. The terminal winter bud is oblique, blunt, flattish, ovate, $\frac{1}{3}$ inch long, brownish, silky-hairy, lateral buds 2-4 together, much smaller. Leaf-scars heart-shaped.

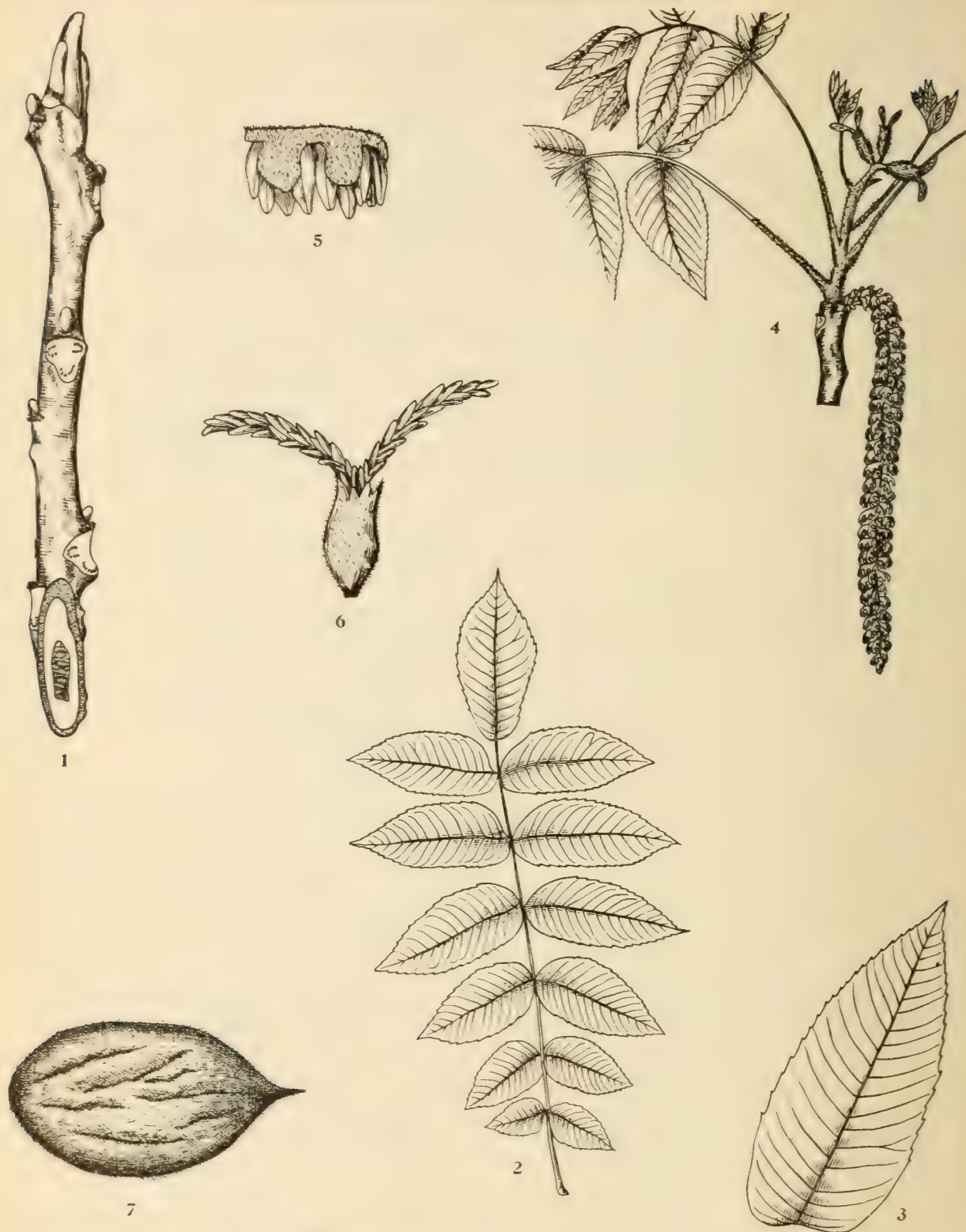
Flowers and Fruits: Flowers produced in May with the leaves; staminate produced in coarse, cylindrical, drooping, green catkins, 3-5 inches long, calyx 6-lobed, on a hairy scale, corolla 0, stamens numerous, 20-30, purplish; pistillate flowers borne singly or in erect clusters of 2-5 on a common stalk, about $\frac{1}{4}$ inch long, green and hairy, calyx 4-lobed, corolla 0. Fruit ripening in October, a globular nut, $1\frac{1}{2}$ -2 inches in diameter, borne upon a short, thick stalk singly or in clustres of 2-3, covered by a smooth, green husk which is green at first, then brown or black, nut dark brown or black with a rough, irregularly furrowed shell, inclosing a sweet, deeply lobed, oily, edible kernel or seed.

Bark, Twigs and Wood: Bark dark brown, tinged with red, chocolate-brown when freshly cut, thick, deeply divided into broad, rounded ridges which become broken on the surface into thick scales; branchlets hairy, brownish, becoming dull orange brown or dark brown; pith cream-colored, divided by horizontal plates. Wood dark chocolate-brown, or sometimes tinged with purple, sapwood lighter, heavy, hard, close-grained, strong, very durable in contact with soil. The finished wood has a beautiful satiny surface, and takes a beautiful polish; used for furniture, interior trim, gunstocks and airplane propellers, also for billiard tables, artists' supplies, and formerly for fence posts and rails; one of our most valuable American woods.

Distribution in the State: The black walnut has entered Nebraska from the east and has spread along the Missouri river northward to the Niobrara thence westward to Cherry county, and along the southern border of the state in the Blue and Republican valleys to Saline and Harlan counties. Map 25.

Remarks: The black walnut growing alone is one of the grandest and most massive American broadleaved trees and it is a fine species to use in a variety of landscape effects. Here in Nebraska the tree has been planted commonly in groves of which there are many fine illustrations in the eastern counties. Although highly prized for years for a great many important uses the wood of this tree was consumed in enormous quantities during the war in the manufacture of war materials, even Nebraska, with her scanty supply, being called upon to sacrifice her walnut trees.

BUTTERNUT. WHITE WALNUT



1. Winter twig, x 1.
2. Leaf, x $\frac{1}{6}$.
3. Leaflet, x $\frac{1}{2}$.
4. Flowering branchlet, x $\frac{1}{2}$.
5. Staminate flower, enlarged.
6. Pistillate flower, enlarged.
7. Fruit, x $\frac{1}{2}$.

(From Otis: Mich. Trees)

BUTTERNUT. WHITE WALNUT

Juglans cinerea L.

The Walnut Family

JUGLANDACEAE

Habit and Habitat: A medium-sized tree, 40-60 feet high, sometimes as tall as 70 feet, and a trunk diameter of 20-30 inches, with a large, broad spreading, horizontal and ascending branches, and stout branchlets, forming an open, wide-spreading, flattish or roundish crown. Prefers rich, moist, lowland soils as along stream courses and fertile, wooded slopes.

Leaves and Buds: Leaves alternate, pinnately compound, 12-25 inches long; leaflets 11-17, oblong-lanceolate, 2-4 inches long, about one-half as wide, finely serrate, thin, yellow-green and more or less scurfy above, hairy beneath, turning yellow in autumn and falling early; petioles stout, hairy. Terminal bud $\frac{1}{2}$ - $\frac{3}{4}$ inch long, somewhat flattened, hairy, brown; lateral buds smaller, ovate, rounded at the apex, in groups of 2-4, scales inconspicuous.

Flowers and Fruits: Flowers produced in May or early June with the leaves; the staminate in cylindrical, green, dropping catkins, 3-5 inches long; calyx 6-lobed, produced in a hairy scale; corolla 0; stamens 8-12, brown; the pistillate flowers solitary or several together in a close cluster toward the tips of the twigs, greenish, sticky-hairy; calyx 4-lobed, hairy; corolla 0, stigmas red. Fruit ripening in October, about 2½ inches long, a cylindrical, pointed, greenish, sticky-hairy, aromatic nut, solitary, or borne in drooping clusters of 3-5, becoming brown as they dry out, inclosing a single rough, edible, seed, rather difficult to remove from the shell.

Bark, Twigs and Wood: Bark light grayish-brown, deeply divided into broad ridges which separate into small, plate-like scales on the surface; twigs and young branches yellow-brown or green, rusty-hairy becoming smooth and light gray; pith chocolate-brown, divided into chambers by horizontal plates. Wood light, soft, weak, coarse-grained, easily worked, light brown, with thin, lighter colored sapwood, surface satiny, polishing beautifully, durable.

Distribution in the State: The butternut is very common in the forests of Arkansas and Missouri from which it has been carried into the southeastern corner of Nebraska as far as Gage, Johnson, Otoe and Cass counties, but it is not common or abundant in any portion of this restricted range in our state. Some have doubted if the species occurs naturally in the state at all, but such doubt can scarcely stand in the face of the fact that the tree has been reported from the above range by very competent authority. This tree has also been planted occasionally, but not nearly so commonly as its near relative the black walnut. I do not know of a single grove of butternut trees in this state. Map 26.

Remarks: The butternut is sometimes used for ornamental planting in parks, but is not nearly so popular as the black walnut for such purposes. The tree does not do so well as the black walnut in Nebraska because it is more susceptible to injury from drought. The wood of this species is also used for furniture, interior finish and for cabinet making, but it is inferior to that of its sister species. The cylindrical, pointed nuts of the butternut constitute perhaps the most striking point of difference between this species and the black walnut. I will welcome specimens of this tree from any part of the state. The English walnut is *Juglans regia*, a native of Asia Minor.

BITTERNUT HICKORY



1. Winter twig, x 1.
2. Leaf, x $\frac{1}{3}$.
3. Flowering branchlet, x $\frac{1}{2}$.
4. Staminate flower, enlarged.
5. Pistillate flower, enlarged.
6. Fruit, x 1.

(From Otis: Mich. Trees)

BITTERNUT HICKORY

Hicoria minima (Marsh.) Britton

The Walnut Family

JUGLANDACEAE

Habit and Habitat: A tall, slender tree, 40-75 feet high, with a trunk diameter of 12-20 inches, or occasionally reaching a height of 100 feet and a diameter of 3 feet; stiff, upright branches form a broad, handsome crown which is often widest near the top. Prefers low, moist and rich soil along stream courses and about ponds and lakes, but is also commonly found on upland slopes and hills. The most rapidly growing of all of the hickories.

Leaves and Buds: Leaves alternate, pinnately compound, 6-10 inches long. Leaflets 7-11, the upper 3-6 inches long and about one-fourth as wide, lanceolate to oblong-lanceolate, long-pointed, often unequally wedge-shaped at the base, coarsely or finely serrate, thin and firm, smooth, bright green above, paler and somewhat downy or smooth below. Petioles slender, slightly grooved, hairy. Foliage fragrant when crushed, turning bright yellow in the autumn. Terminal bud $\frac{1}{3}$ - $\frac{3}{4}$ inch long, long-pointed, flattish, sulphur-yellow, granular; lateral buds much smaller, somewhat 4-angled.

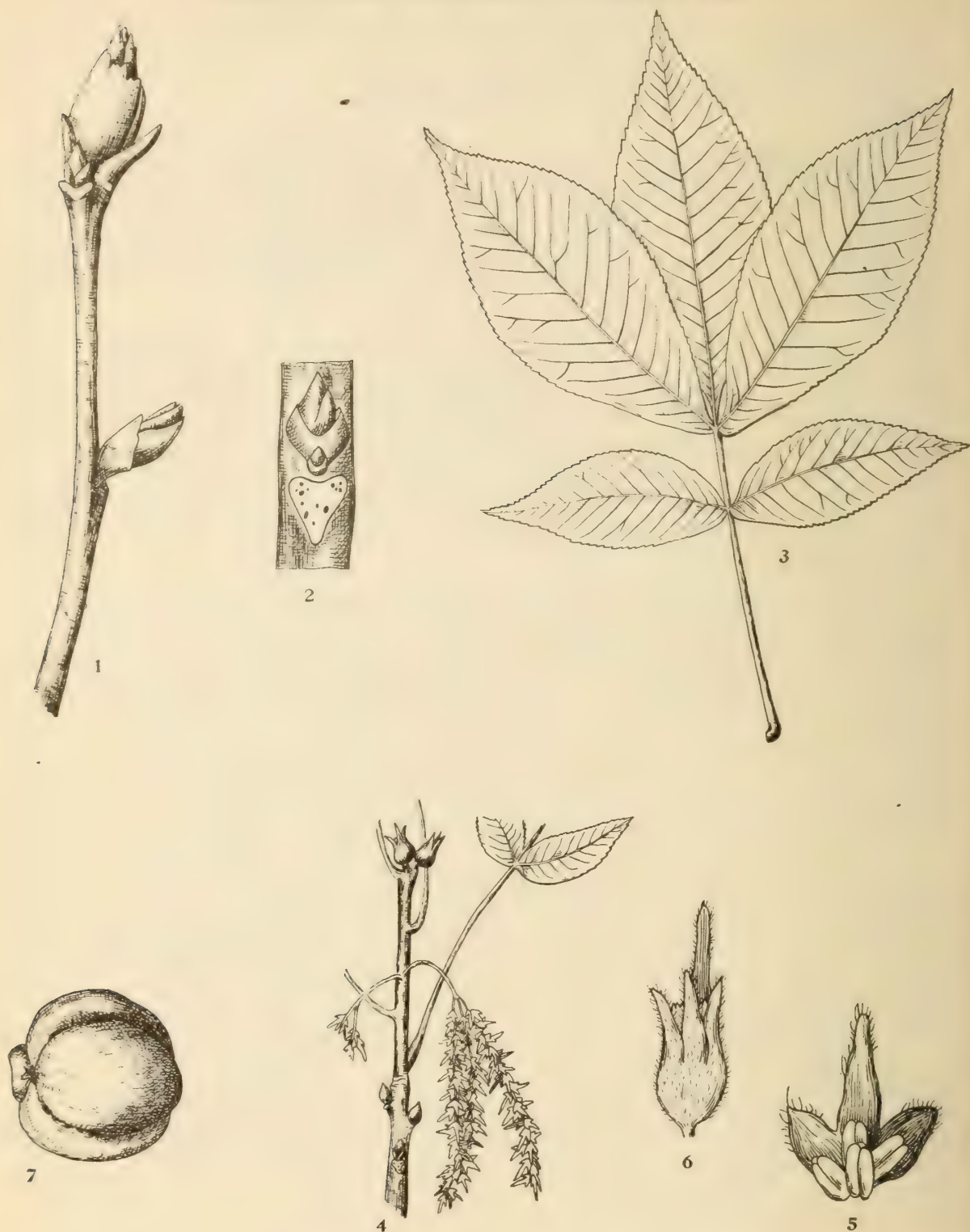
Flowers and Fruits: Flowers produced in May or June after the leaves, the staminate in pendulous, green, slightly hairy catkins, 3-4 inches long, borne in clusters of three; scales 3-lobed, hairy; stamens 4, yellow. Pistillate flowers in 2-5-flowered clusters, $\frac{1}{2}$ inch long, angled, covered with yellow hairs; calyx 4-lobed, hairy; corolla 0; stigmas 2, greenish. Fruit an ovate to globular nut, about 1 inch long, with a yellow, scurfy surface and a very thin husk splitting half-way to the base along four sides, with more or less winged sutures at the top, nut smooth, globular, $\frac{3}{4}$ -1 $\frac{1}{4}$ inch thick, gray, tinged with red, shell thin; kernel fleshy, but bitter, not edible, ripening late in October.

Bark, Twigs and Wood: The twigs are greenish and more or less downy, but become brownish and finally gray. Bark on old branches and main trunk close and gray or gray tinged with brown or red, smooth or often broken up into closely connected, shallow ridges, rarely broken into scales or plates. Wood dark brown with lighter colored sapwood, close-grained, heavy, very hard, strong, tough, elastic, durable; an excellent fuel.

Distribution in the State: This is the only common hickory in Nebraska and it is confined to woods of the southeastern corner of the state from Richardson county northward to Cass county and westward to Pawnee, Gage and Lancaster counties where it is often seen mingled with the elms, oaks and ashes of the gallery woods along the streams and upon the slopes and ridges. This is the most westerly species of our native hickories. Map 21.

Remarks: The bitternut may be readily distinguished from our other three hickories by means of the slender, sulphur-colored buds, the smaller leaves with their narrow leaflets, and the smaller nuts with their thin leathery husk, thin shell, and very bitter kernels. This species is often found in very wet soil farther east and for that reason it is called "swamp hickory" in some localities. The trees may be propagated by planting the nuts where the trees are to grow; the trees, even the young ones, are difficult to transplant.

SHELLBARK HICKORY. SHAGBARK



1. Winter twig, x 1.
2. Portion of twig, enlarged.
3. Leaf, x $\frac{1}{3}$.
4. Flowering branchlet, x $\frac{1}{2}$.
5. Staminate flower, enlarged.
6. Pistillate flower, enlarged.
7. Fruit, x $\frac{1}{2}$.

(From Otis: Mich. Trees)

SHELLBARK HICKORY. SHAGBARK

Hicoria ovata (Mill.) Britton

The Walnut Family

JUGLANDACEAE

Habit and Habitat: A medium-sized tree, 40-70 feet high, with a slender, columnar trunk 1-2 feet in diameter; forming a narrow, rounded, more or less open crown of stout branches and twigs. I have seen trees in the forests of the east that were nearly 100 feet high. Prefers a deep, rich, moist, loamy soil as found on river flats or low woodlands. The tap-root is large and vigorous and hence the tree is difficult to transplant.

Leaves and Buds: Leaves alternate, pinnately compound, 6-12 inches long. Leaflets usually 5, the upper 5-7 inches long and 2-3 inches wide, the lower pair smaller, obovate to oblong-lanceolate, finely serrate, thick, firm, more or less leathery, smooth, dark green above, paler beneath and sometimes finely downy, aromatic when crushed; petioles stout, smooth or hairy, enlarged at the base. Terminal bud broadly ovate, $\frac{1}{2}$ - $\frac{3}{4}$ inch long, dark brown, pale hairy or almost smooth, inner scales enlarging as spring growth begins, becoming 2-3 inches long, yellowish green, tinged with red, downy, persisting until the leaves are about half grown.

Flowers and Fruits: Flowers produced in May, the staminate in hairy, greenish, pendulous catkins, 4-5 inches long, in groups of three; staminate scales 3-parted, bearded, with 4 yellow stamens; pistillate flowers in 2-5-flowered clusters, $\frac{1}{3}$ inch long, brown-hairy; calyx 4-lobed, hairy; corolla 0. Fruit ripening in October, solitary or in pairs, 1-2 inches long, with a thick, dry, light brown, 4-valved husk which splits easily, especially after frost, bearing a single, 4-ridged nut, with thick, hard, whitish shell inside of which is a large, sweet, aromatic seed or kernel.

Bark, Twigs and Wood: Bark on young stems and twigs downy or smooth, light green, becoming brownish or gray, later light gray and shiny, on old branches and the main trunk, dark gray and separating into thick, ragged strips, 1-2 inches wide and 1-3 feet long, which cling to the trunk by the middle thus producing the characteristic shaggy appearance so well known for this species. Wood hard, heavy, strong, elastic, close-grained, light brown with nearly white sapwood; used in the manufacture of agricultural implements, carriages, tool handles, and fuel.

Distribution in the State: A very common tree in the forests of northern and eastern United States and in the forests of Missouri from which it has entered Nebraska near the southeastern corner and has extended itself northward to Cass county and westward to Gage county. Map 22.

Remarks: This is perhaps the best known hickory of North America. It yields the common small hickory nuts of commerce. The tree is hardy throughout its range and because of its ornamental qualities it has been planted to some extent in parks and private estates. It has also been planted for the nuts which find a ready market. The wood is largely used for ax and tool handles, plane blocks, wooden screws, baskets, fuel, and in the manufacture of implements, carriages, wagons, automobiles, gymnasium apparatus, boxes, barrels, tubs, etc. Hickory is probably our very best fuel wood.

BIG HICKORY. BIG NUT



1. Winter twig, x $\frac{1}{2}$.
2. Leaf, x $\frac{1}{4}$.
3. Flowering branchlet, x $\frac{1}{2}$.
4. Staminate flower, enlarged.
5. Pistillate flower, enlarged.
6. Fruit, x $\frac{1}{2}$.

(From Otis: Mich. Trees)

BIG HICKORY. BIG NUT
Hicoria laciniosa (Michx. f.) Sarg.

The Walnut Family
JUGLANDACEAE

Habit and Habitat: A tree, commonly 60-80 feet high, and with a trunk diameter of 2-3 feet, although occasionally 100-120 feet high and 3-4 feet in diameter, usually much smaller in this state; forming a narrow, oblong crown of small branches, with more or less drooping lower branches and large, handsome leaves. Prefers the deep, rich, moist soils of bottom-lands along streams and in the deeper woods.

Leaves and Buds: Leaves alternate, pinnately compound, 1-2 feet long. Leaflets usually 7, the upper 5-8 inches long, 3-5 inches broad, larger than the lowest pair, oblong-lanceolate to obovate, taper-pointed, thick and firm, finely serrate, shiny and dark green above, paler and softly-hairy beneath. Petioles stout, often persisting after the leaflets fall. Foliage fragrant when crushed. Terminal bud about 1 inch long, ovoid, obtuse, dark brown, soft-downy or velvety, becoming greatly enlarged with the commencement of growth in the spring.

Flowers and Fruits: Flowers produced in May after the leaves, the staminate in pendulous, cylindrical, scaly catkins, 5-7 inches long, slender, yellow-green, in groups of three; scales 3-lobed, hairy; stamens 4, yellow, hairy; the pistillate flowers in crowded 2-5-flowered, hairy clusters; calyx 3-toothed, hairy; corolla 0. Fruit ripening in October or soon after the first frosts, oblong to globose, 1 $\frac{3}{4}$ -2 $\frac{1}{2}$ inches long, with a very thick, woody husk which is green at first, later light brown, splitting to the base when ripe, inclosing a large, 4-6-ridged nut, with thick, hard shell and a large, sweet kernel or seed.

Bark, Twigs and Wood: The bark on young branches and twigs is orange colored and more or less pubescent, becoming darker and finally gray, on the old trunk it becomes thick, light gray, and separates into broad, thick plates 3-4 feet long which cling to the trunk for many years and give to the tree an appearance like that of the shagbark. The wood is hard, heavy, strong, tough, close-grained, elastic, dark brown, with thin, whitish sapwood; used for practically any use to which the wood of the shagbark hickory is put.

Distribution in the State: This hickory finds its most agreeable home in northern United States with a center in the Ohio valley westward from western Pennsylvania. Occurs commonly in the Missouri forests from which it has moved northward along the Missouri river into Nebraska from Richardson county northward in a narrow belt to Sarpy county. The tree is not at all common or abundant in this restricted range. Map 24.

Remarks: The king nut may be distinguished from the other species of hickory by the orange colored branchlets and from many of them by the very large nuts. The nuts are not considered so good as those of the shagbark and they do not find so ready a market nor do they command so high a price as the smaller nuts of the shagbark. This species is more strictly confined to the rich bottom-land sites than is the shagbark. The latter species is often found in rather dry open woods in our state. It is interesting to note that there are no native hickory trees found west of the Great Plains, they are all confined to eastern United States, and there are none in any other part of the world.

MOCKERNUT HICKORY



1. Winter twig x 1.
2. Leaf, x $\frac{1}{3}$.
3. Flowering branchlet, x $\frac{1}{2}$.
4. Staminate flower, enlarged.
5. Pistillate flower, enlarged.
6. Fruit, x $\frac{1}{2}$.

(From Otis: Mich. Trees)

MOCKERNUT HICKORY

Hicoria alba (L.) Britton

The Walnut Family

JUGLANDACEAE

Habit and Habitat: A medium-sized tree, 40-60 feet high, with a trunk diameter of 1-2½ feet, but attains a maximum size of 100 feet in height and a diameter of 3 feet; upright branches and stout twigs form a wide-topped and more or less spreading crown, a habit which is emphasized when the tree is isolated from other trees. This species is commonly found on hillsides and ridges, but develops to the greatest proportions in rich, well-drained and moist soils, although it will not do well in as moist sites as are more preferable to the shagbark and big nut hickories.

Leaves and Buds: Leaves alternate, pinnately compound, 8-12 inches long, fragrant when crushed. Leaflets 5-7, sometimes 9, the upper 5-8 inches long, 2-3 inches wide, oblong, to ovate-lanceolate, finely serrate, thick and firm, shiny, dark yellow-green above, paler, orange or brown, and more or less hairy beneath. Petioles hairy. Clear or rusty yellow in autumn. Terminal bud ½-¾ inch long, broadly ovate, acute, reddish-brown, downy, outer scales fall in autumn, inner scales enlarging greatly when spring growth begins.

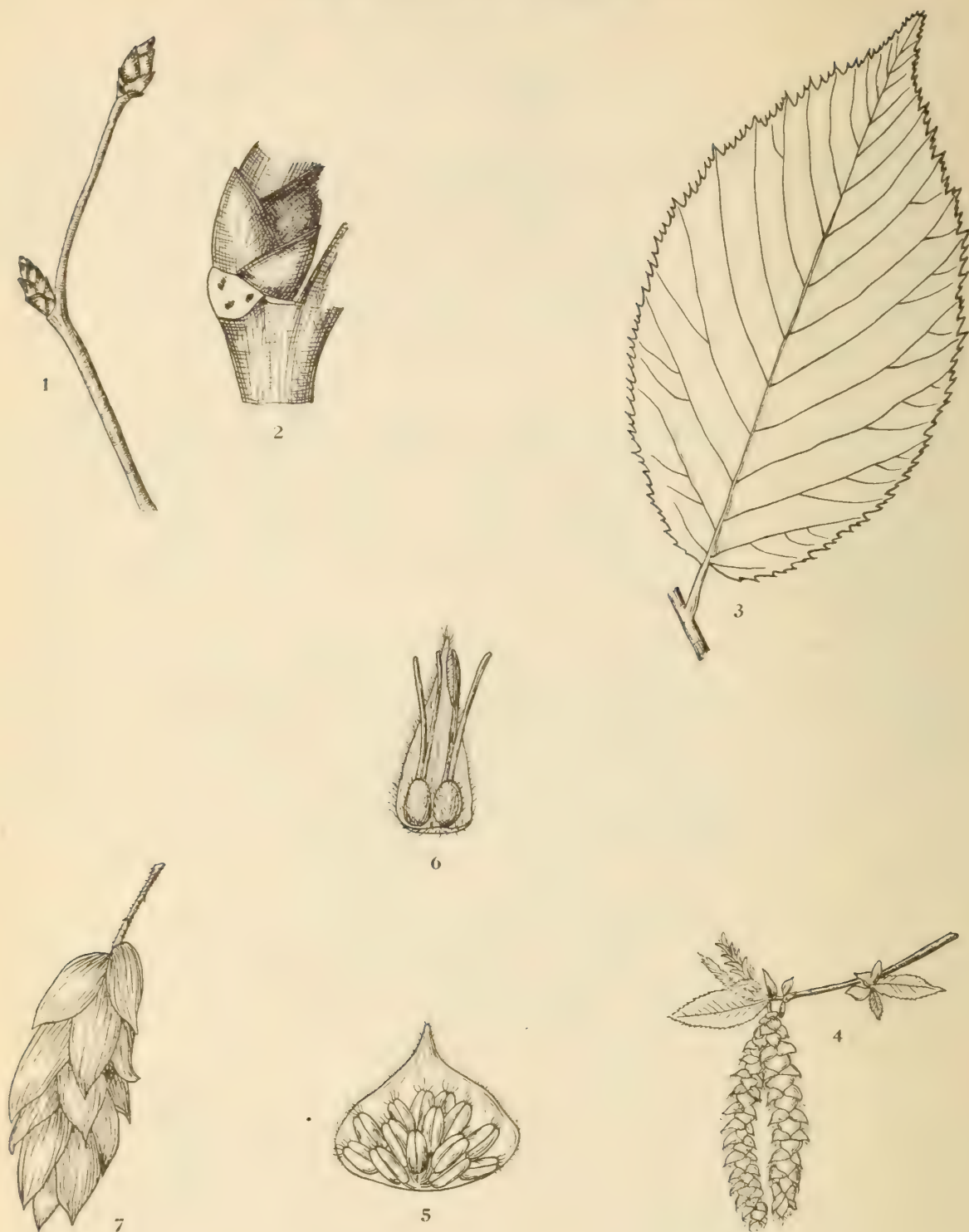
Flowers and Fruits: Flowers produced in May when the leaves are full grown; the staminate in slender, greenish, pendulous catkins 4-5 inches long, in groups of three; scales 3-lobed, hairy; stamens 4-5, red, yellowish; calyx toothed. Pistillate flowers in crowded, 2-5-flowered clusters, hairy; calyx toothed, hairy; corolla 0; stigmas 2, red, hairy. Fruit spherical, oblong or globose, dark reddish-brown, 1½-2 inches long, with thick husk, splitting to the middle or nearly to the base, nut spherical or oblong, often long-pointed, 4-ridged, pale, reddish-brown with very thick, hard shell and small, sweet, edible seed or kernel, ripening in October.

Bark, Twigs and Wood: Bark on old branches light to dark gray, with shallow, irregular fissures and closely appressed scales, becoming very rugged on old trunks; branchlets stout, brownish-hairy at first, becoming smooth and gray and gradually darkening. The wood is dark brown with nearly white sapwood, heavy, hard, strong, tough, close-grained, elastic, durable, widely used, excellent as fuel.

Distribution in the State: Like the other hickories, the mockernut is not found abundantly anywhere in Nebraska. It occurs commonly in the forests of Iowa and Missouri from whence it would readily come into our state. It has been reported for southeastern Nebraska from Richardson county and extending in a narrow belt northward to Cass county, but is probably the most rarely found of our four native species of hickory. Map 23.

Remarks: The wood of the mockernut is practically as good as that of the shagbark hickory, with which it is often confused commercially, and it is used for about the same purposes as other hickory woods. This species is probably called mockernut because of the disappointing nature of its nuts, which are large and promising from the exterior but which contain a surprisingly small kernel which is difficult to extract. The large leaves emit a pleasant, resinous fragrance when bruised or crushed.

HOP HORNBEAM. IRONWOOD



1. Winter twig, x $\frac{1}{2}$.
2. Portion of twig, enlarged.
3. Leaf, x $\frac{1}{2}$.
4. Flowering branchlet, x $\frac{1}{2}$.
5. Staminate flower, enlarged.
6. Pistillate flower, enlarged.
7. Fruit, x $\frac{1}{2}$.

(From Otis: Mich. Trees)

HOP HORNBEAM OR IRONWOOD

Ostrya virginiana (Mill.) Willd.

The Birch Family

BETULACEAE

Habit and Habitat: A small tree, in our state usually less than 25 feet high, with a trunk diameter of less than 8 inches; crown rounded, formed from many long, slender branches and from many slender twigs or sprays. Prefers the light shady, rich, more or less open woods where it often forms clumps or distinct communities upon the slopes of ravines beneath the shade of the other trees. Very seldom seen in the open.

Leaves and Buds: The leaves are alternate, simple, 2-4 inches long, about one-half as broad, oblong to ovate, sometimes unsymmetrical at the base, sharply and doubly serrate, thin and tough, dull, dark green above, pale and more or less softly pubescent beneath; petioles short, slender, somewhat hairy. Terminal buds absent; lateral buds about $\frac{1}{2}$ inch long or longer, ovoid, sharp-pointed, scales reddish-brown.

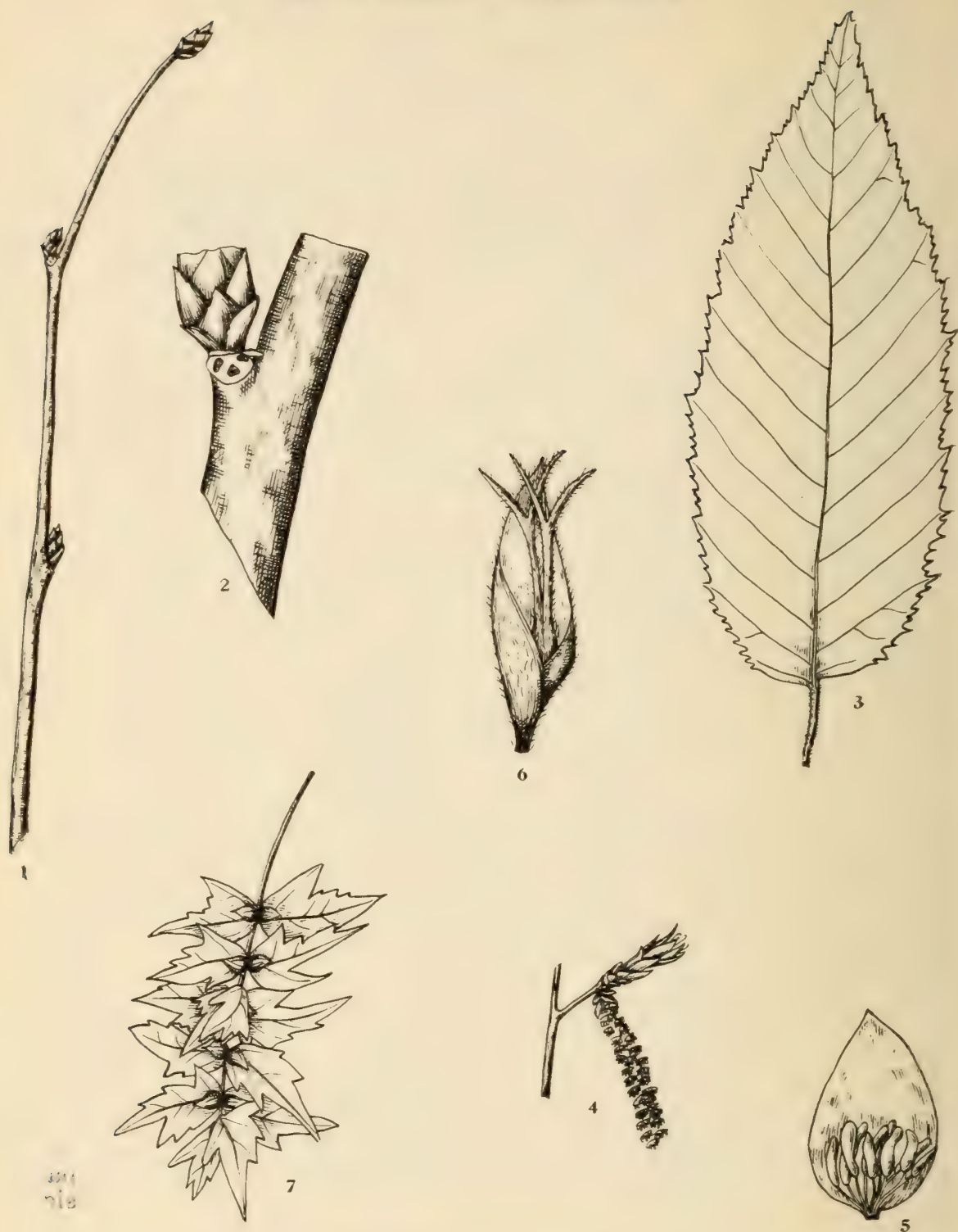
Flowers and Fruits: Flowers appearing in late April or early May at about same time as the leaves; staminate in pendulous, cylindrical catkins about like those of the birch, from the previous seasons growth, often in threes; pistillate catkins usually in pairs, in erect, lax catkins on the current season's shoots, each flower being enclosed in a hairy, sack-like envelope. The fruits ripen in early fall and are arranged in hop-like clusters, hence the name, hop hornbeam. Each fruit is about $\frac{1}{2}$ inch long and consists of a membranous inflated bag containing a small nut-like seed. Each of the hop-like clusters of fruits is 1-2 inches long.

Bark, Twigs and Wood: The twigs are light, shining green at first but become reddish-brown when older, and finally dull, dark brown; the bark on the older branches and the main trunk is grayish-brown, thin, narrowly, longitudinally ridged and sometimes the tops of the ridges become more or less scaly or stringy. The wood is very hard, heavy and strong, tough, close-grained, durable in contact with the soil, light brown or the sapwood whitish. Rather slow growing.

Distribution in the State: This species is found in nearly all parts of eastern United States but in Nebraska it is restricted to a narrow belt along the Missouri river and the lower courses of its tributaries to the mouth of the Niobrara river and thence westward in the form of a narrow belt along the Niobrara river and Pine Ridge to the north-western corner of the state. In many places it is a very conspicuous member of the under-story vegetation of our natural woodlands, covering the slopes of the ravines in the above mentioned parts of the state. Map 27.

Remarks: The hop hornbeam is sometimes mistaken for an elm, but the fruits of the former should serve to distinguish the tree very clearly from all of our other species. The tree is too small and too slow of growth to make it a good street and open lawn tree, but as a tree for underplanting in woodlots it is desirable. Because of its toughness, hardness, durability and elasticity the wood is used for levers, handles, mallets and fence posts.

BLUE BEECH. HORNBEAM



1. Winter twig, x 1.
2. Portion of twig, enlarged.
3. Leaf, x 1.
4. Flowering branchlet x $\frac{1}{2}$.
5. Staminate flower, enlarged.
6. Pistillate flower, enlarged.
7. Fruit, x $\frac{1}{2}$.

(From Otis: Mich. Trees)

BLUE BEECH. HORNBEAM

Carpinus caroliniana Walt.

The Birch Family

BETULACEAE

Habit and Habitat: A low, bushy tree, or tall shrub, 10-30 feet in height, with a trunk diameter of 4-12 inches; trunk short, usually peculiarly and irregularly fluted; the numerous slender branches and fine spray produce a close, rounded or flat-topped crown. Common along the borders of streams and swamps and in the rich, moist soil of shady woods on slopes and hills.

Leaves and Buds: Leaves alternate, simple, 2-4 inches long, 1-2 inches wide, ovate-oblong, long-pointed, rounded, or wedge-shaped, often unequal at the base, doubly and sharply serrate, smooth, dull, deep green above, paler beneath, turning brilliant scarlet and orange in autumn; petioles short, slender, hairy. Winter-buds ovate, acute, chestnut brown, $\frac{1}{8}$ inch long, more or less hairy, inner scales enlarge when spring growth begins; no terminal bud present.

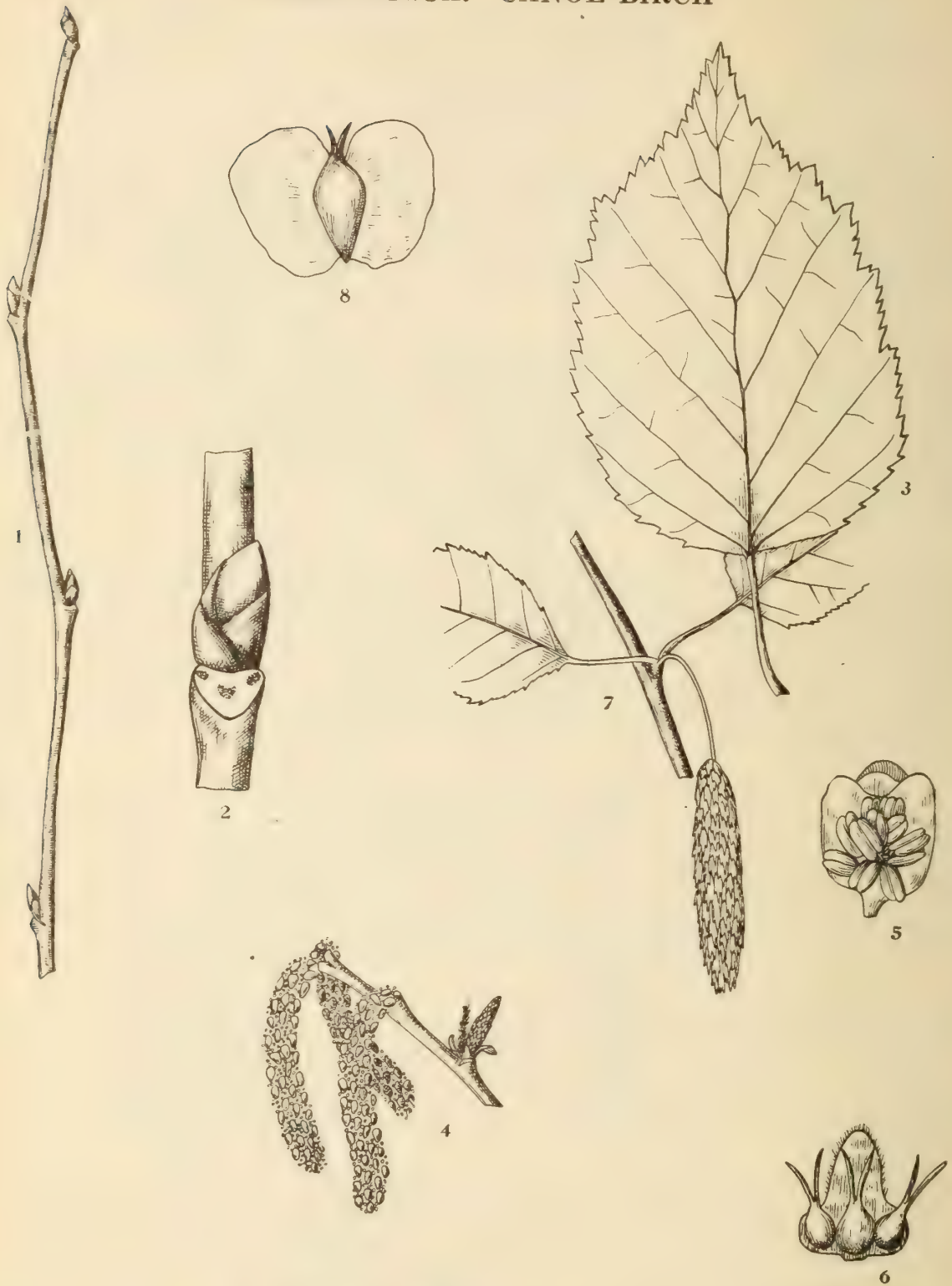
Flowers and Fruits: Flowers produced in catkins late in April or in May, after the leaves; staminate catkins 1-1 $\frac{1}{2}$ inches long, with greenish scales; stamens 3-20, borne in the boat-shaped scales; pistillate catkins $\frac{1}{2}$ - $\frac{3}{4}$ inches long, scales thin, hairy, greenish, each scale bearing 2 pistillate flowers with long scarlet styles. Fruit ripening in mid-summer, but may remain on the trees long after the leaves fall, in loose, terminal, leafy cone-like clusters, each leafy bract deeply lobed, short-stalked, partially inclosing a small oval, brownish nut.

Bark, Twigs and Wood: Bark on the larger trees near the base furrowed, on young trees and branches thin, smooth, close, dark bluish gray, often mottled with light or dark patches, on young twigs at first pale green changing to dull brown and finally dull, bluish gray. Twigs and branches long, tough, often crooked or irregular. Wood light brown, with thick, nearly white sapwood, heavy, hard, very tough, close-grained, very strong; used for levers, tool handles, brooms, withes, etc.

Distribution in the State: Occurs throughout eastern United States except southern Florida and as far west as Arkansas and Missouri from whence it has probably followed the Missouri river into Nebraska. It has been reported from Sarpy county and also from Brown county. In fact the species is not especially conspicuous at any place in its wide range; becoming most abundant and of largest size in Arkansas.

Remarks: The blue beech is a desirable tree for planting in parks and lawns where the soil is deep, rich and moist and where a considerable degree of shade may be secured. The dark, blue-green summer foliage and the beautiful autumn tints of the blue beech are strong features in its quality as an ornamental. The tree is also famous because of the very tough nature of the wood. Early settlers in the northern states often made their ox-gads from blue beech wood. I am anxious to have specimens of this plant from different parts of the state since there are no authentic specimens of the species from Nebraska in our herbarium. There is, in fact, some doubt as to the occurrence of the species in this state.

PAPER BIRCH. CANOE BIRCH



1. Winter twig, x 1.
2. Portion of twig, enlarged.
3. Leaf, x 1.
4. Flowering branchlet, x $\frac{1}{2}$.
5. Staminate flower, enlarged.
6. Pistillate flower, enlarged.
7. Fruiting branchlet, x $\frac{1}{2}$.
8. Fruit, x $\frac{1}{3}$.

(From Otis: Mich. Trees)

THE PAPER BIRCH OR CANOE BIRCH

Betula papyrifera Marsh.

The Birch Family

BETULACEAE

Habit and Habitat: A tree, 60-70 feet high, with a trunk diameter of 1-2 feet, with a compact, rounded or pyramidal crown with much fine spray, and in older life a tall, branchless trunk with a broad, open crown composed of ascending, slender branches. The paper birch prefers the rich, moist soil of canyon bottoms and hillsides, usually in the immediate vicinity of streams or lakes. It is also occasionally seen in drier sites.

Leaves and Buds: Leaves alternate, simple, 2-3 inches long and about one-half as broad, coarsely and often more or less doubly serrate, thick and firm, smooth, dark green above, paler beneath, covered with tiny yellowish glands which are readily visible by means of a hand lens, turning bright yellow in the fall; petioles short, stout, usually yellow. Lateral buds $\frac{1}{4}$ inch long, narrow, conical, somewhat flattened, more or less resinous, usually pointing outwardly from the zigzag twigs.

Flowers and Fruits: Flowers in catkins, appearing in early spring, in April or late March; the staminate catkins clustered, or commonly in pairs, 2-3 inches long, slender, brownish, pendulous; the pistillate catkins are about one-half as long, slender and erect, greenish. The staminate catkins are usually prominent throughout the winter. The fruiting catkins ripen in the autumn with long slender stalks and with crowded hairy scales enclosing dozens of yellowish-brown seeds, each with two broad, membranous wings.

Bark, Twigs and Wood: The bark on the older branches and main trunk is creamy-white and shiny on the surface, orange colored in the interior, readily separating into thin, papery layers. On the oldest trees the bark becomes furrowed and dark on the lower part of the trunks. The twigs are dull red, becoming shiny and yellowish. The wood is light, hard, strong, tough, close-grained and uniform in structure and color, light brown or sometimes slightly tinged with red.

Distribution in the State: This tree occurs naturally only in the deep, spring-branch canyons and on the bluffs along the Niobrara river in Keya Paha, Brown and Cherry counties where it was left by the retreating ice sheet toward the close of the glacial period. Many large trees of the species occur in that region. It is much more abundant farther to the northward and eastward as in Minnesota and Wisconsin, and it is also common in the Black Hills of South Dakota. Paper birch has been planted in all parts of the state. It does well, however, only in the humid eastern counties. Map 28.

Remarks: The paper birch is a rapidly growing tree and this quality taken with the striking appearance of the bark make it a very desirable ornamental tree. The wood is used in great quantities for spools, toothpicks, bobbins, etc., the supplies coming mostly from the forests of the northeastern states. Birch is also a popular wood for interior trim, less popular as a furniture wood. The northern Indians and trappers used the readily moulded bark for canoes, wigwams, baskets, pails, etc. It is easily possible to make a water-tight cup or bucket out of birch bark without a single tack or bit of metal.

WESTERN BLACK BIRCH



1. Winter twig, x 1.
2. Staminate catkins, x 1.
3. Leaf, x 1.
4. Fruiting catkin, x 1.
5. Pistillate flower, enlarged.
6. Scale from fruiting catkin, enlarged.
7. Winged fruit, greatly enlarged.

(Original

WESTERN BLACK BIRCH

Betula fontinalis Sarg.

The Birch Family

BETULACEAE

Habit and Habitat: A small tree, occasionally 30-40 feet tall, with a trunk diameter of 12-18 inches, but commonly much smaller and crowded into dense thickets; numerous slender, spreading branches produce an open, feathery crown; often shrubby, with thin, spreading stems, in open clusters 15-20 feet high or even lower. Prefers the moist soil of stream banks in foothill and mountain canyons and ravines.

Leaves and Buds: Leaves simple, alternate, broadly ovate, acute, sharply and often doubly serrate, except at the wedge-shaped, heart-shaped or unequal base, pale green and more or less soft hairy above, and covered with conspicuous resinous glands when young, pale yellow-green beneath, with scattered, tiny glandular dots, 1-2 inches long, $\frac{3}{4}$ -1 inch wide, turning dull yellow in autumn; petioles stout, finely hairy, light yellow or tinged with red, flattish, $\frac{1}{3}$ - $\frac{1}{2}$ inch long. Winter-buds oval to ovate, acute, very resinous, chestnut-brown, $\frac{1}{4}$ inch long.

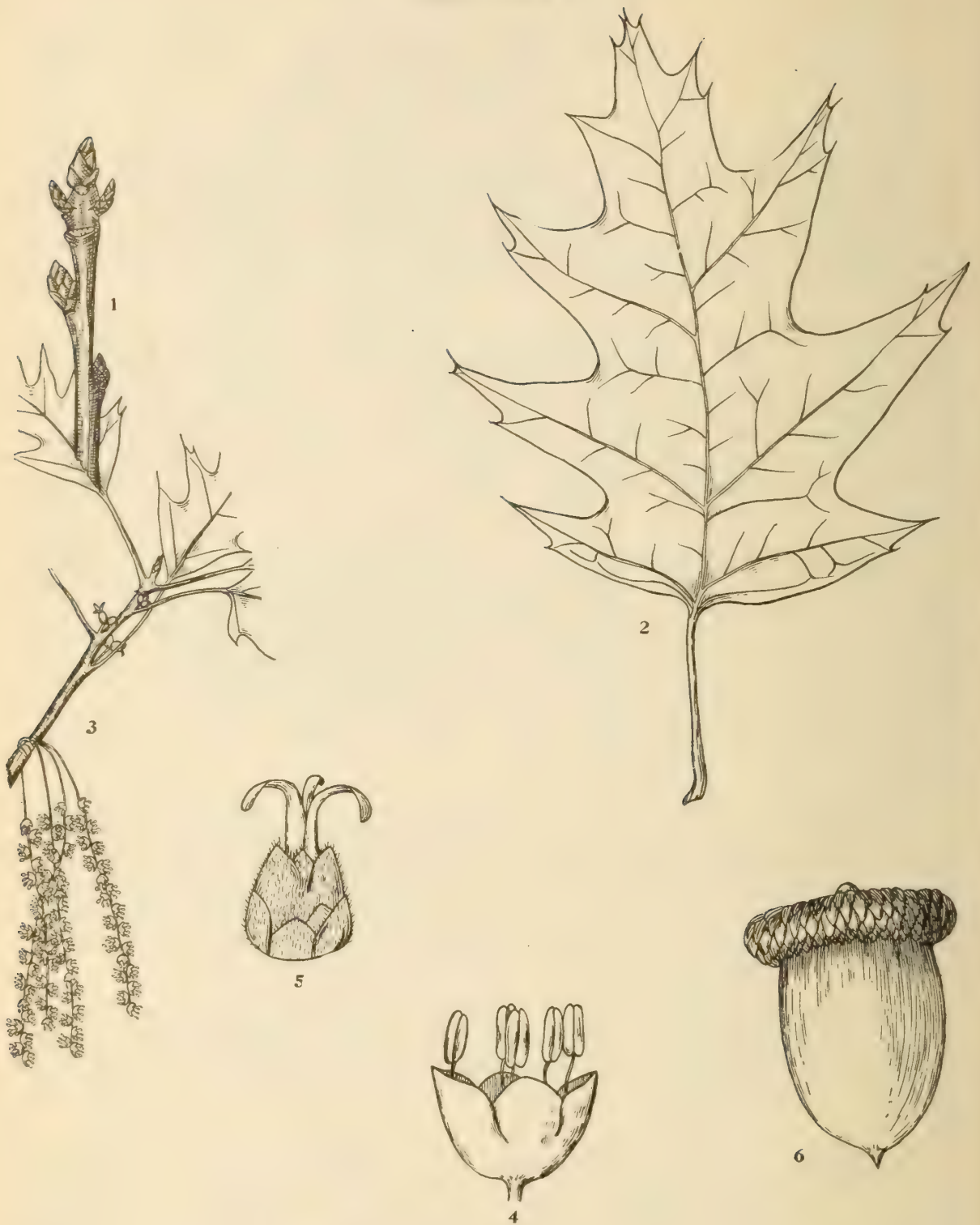
Flowers and Fruits: Flowers produced in catkins in early spring. Staminate catkins clustered toward the tips of the twigs, $\frac{1}{2}$ - $\frac{3}{4}$ inch long and $\frac{1}{8}$ inch thick in winter, becoming 2-2 $\frac{1}{2}$ inches long and $\frac{1}{8}$ inch thick in spring, scales ovate, acute, chestnut-brown. Pistillate catkins usually single in the axils of the young leaves, short-stalked, about $\frac{3}{4}$ inch long, with ovate, acute green scales; styles bright red. Fruit a broadly cylindrical, dry, scaly cone, 1-1 $\frac{1}{4}$ inches long, erect or pendulous on slender stalks $\frac{1}{4}$ - $\frac{3}{4}$ inch long; seeds numerous, ovate or obovate, much narrower than their wings.

Bark, Twigs and Wood: Branchlets light green and very rough at first, soon becoming dark orange-colored and bright reddish-brown in the first winter, dark reddish-brown or bronzed and very shiny the second season; bark on old branches and the main trunk thin, dark bronze color or brown, very shiny, marked by pale, longitudinal streaks, not separable into thin layers. Wood soft, strong, light brown, with thick lighter colored sapwood; used for fuel and fence posts.

Distribution in the State: This birch occurs abundantly in the Rocky Mountains west of Nebraska and in the Black Hills and it has extended its range eastward into Sioux county, Nebraska, where it is commonly found along the streams in the cool canyons of Pine Ridge. Map 29.

Remarks: This species is more commonly seen in Sioux county in the clustered bushy, shrubby forms than as well developed, isolated tree forms. Another black birch, *Betula nigra* L., an eastern tree, has been reported for Nebraska, but I have been unable to find any authentic specimens collected in this state or to receive unmistakable evidence of the presence of the species within our borders. It has been reported from Cass county. Those interested in trees should watch carefully for this tree when out botanizing in southeastern Nebraska; we shall be greatly pleased to secure authentic specimens of the species collected in this state. The tree is common in the forests of northern and western Missouri.

RED OAK



- 1 Winter twig, x 1.
2. Leaf, x $\frac{1}{2}$.
3. Flowering branchlet, x $\frac{1}{2}$.
4. Staminate flower, enlarged.
5. Pistillate flower, enlarged.
6. Fruit, x 1.

(From Otis: Mich. Trees)

RED OAK
Quercus rubra L.

The Oak Family
FAGACEAE

Habit and Habitat: A large tree, 70-80 feet high, sometimes 100-140 feet high, with a trunk diameter of 2-4 feet, with stout, bulky, horizontal branches forming a narrow or broad, rounded crown of wide-spreading branches and slender, flexible branchlets. Tolerant of many soils, and varied situations, but prefers rich, moist loam or glacial drift along stream courses and in deep woodlands; keeps close to the streams in our state.

Leaves and Buds: Leaves alternate, simple, 5-9 inches long, 4-6 inches wide, oval to obovate, 5-11-lobed, with coarse-toothed, blade-tipped lobes, tapering from broad rounded indentations, thin and firm, dull, dark green and smooth above, paler beneath, turning rich red in autumn or often brown. Petioles stout, 1-2 inches long, often red. Buds light chestnut-brown, $\frac{1}{8}$ - $\frac{1}{4}$ inch long, ovoid, acute, smooth.

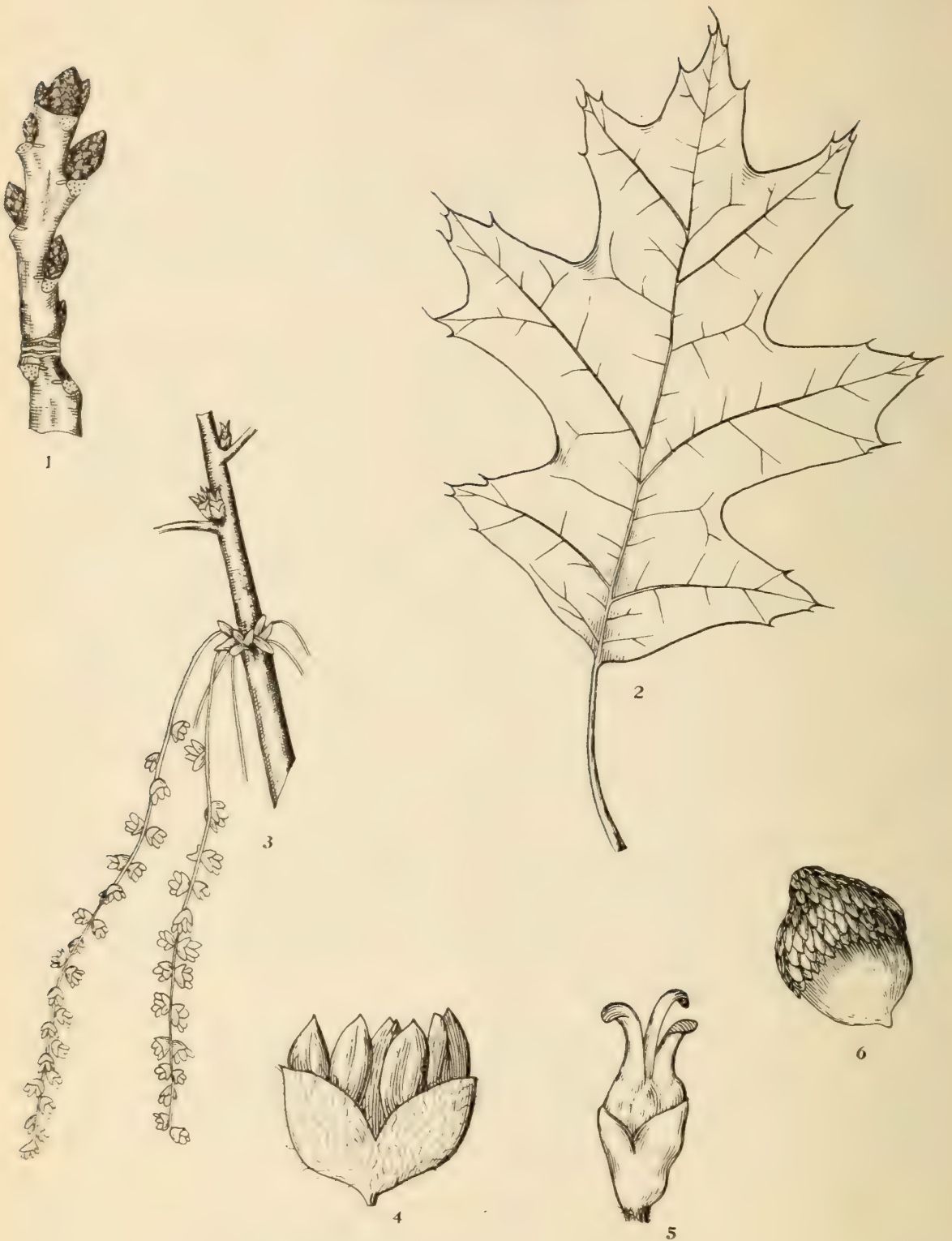
Flowers and Fruits: Flowers produced in May when the leaves are about half grown; staminate in drooping, slender, hairy catkins, 4-5 inches long; calyx 4-5-lobed, greenish; corolla 0; stamens 4-5, yellow; pistillate flowers borne on short, smooth stalks, singly or commonly in pairs in the axils of the immature leaves; stigmas long, spreading, green. The acorns ripen in the autumn of the second year, that is, taking two full summers for their full development, solitary or in pairs, short-stalked or stalkless; cup shallow, saucer-shaped, usually inclosing only the base of the acorn or nut; scales of the cup appressed, more or less glossy, reddish-brown, somewhat downy within; nut or acorn oblong-ovoid with a broad base, 1 inch long, often nearly as thick, reddish-brown, kernel white or pinkish, very bitter, not edible.

Bark, Twigs and Wood: Young twigs shiny, green, becoming reddish and finally dark brown; bark on young trunks smooth, grayish-brown, on old branches and the main trunk darker, shallowly fissured into thin, firm, broad ridges which rarely become more or less scaly; inner bark light red, rich in tannic acid. Wood heavy, hard, strong, coarse-grained, liable to check badly in drying, light reddish-brown, with thin darker colored sapwood.

Distribution in the State: Very common in the forests of northeastern United States and southeastern Canada from which it has extended westward to Minnesota, Iowa, Nebraska and Kansas. In Nebraska the species is quite commonly seen in the woods along the Missouri river and the lower courses of its tributaries from Richardson county northward to Dixon county and westward to Gage and Lancaster counties. Map 13.

Remarks: The red oak is the second most common and abundant native oak in Nebraska, bur oak being the commonest and most abundant. The leaves come out of the buds a beautiful pink and white, but become deep, shining green by midsummer and in the fall they turn to a rich dark purplish-red. The large acorns and the large, very shallow acorn cups will always serve to identify this species among other Nebraska oaks. Since the acorns require two summers for their maturation we may almost always find small, immature acorns on the last season's twigs, and mature acorns on the ground beneath the trees. The wood of red oak is very valuable for the manufacture of furniture and also for interior trim. The tree is also an excellent ornamental.

BLACK OAK



1. Winter twig x 1.
2. Leaf, x $\frac{1}{2}$.
3. Flowering branchlet, x $\frac{1}{2}$.
4. Staminate flower, enlarged.
5. Pistillate flower, enlarged.
6. Fruit, x 1.

(From Otis: Mich. Trees)

BLACK OAK

The Oak Family

FAGACEAE

Quercus velutina Lam.

Habit and Habitat: A medium-sized tree, 50-60 feet high with a trunk diameter of 1-3 feet, occasionally 100-150 feet high and 4 feet in trunk diameter; branches slender, spreading, forming a narrow or wide-spreading, open, rounded crown. Found most commonly on dry gravelly or clayey hills and uplands, and poor soils in general, seldom seen in rich, moist soil.

Leaves and Buds: Leaves alternate, simple, 5-10 inches long, 3-8 inches broad, ovate to oblong, often 7-lobed, some with shallow indentations, broad rounded, pointed lobes, others with wide and deep, rounded indentations which reach half-way to the midrib or further and narrow-oblong or triangular, bristle-tipped lobes, bright crimson as they unfold from the bud, and covered by long, loose, scattered, white hairs and below with thick pale silvery-white, matted hairs, at maturity thick and firm and more or less leathery, dark and shiny above, pale and more or less hairy beneath, in late autumn turning dull red, dark orange color or brown and falling gradually during the winter; the lobes more or less coarse-toothed, each tooth bristle-tipped. Petioles stout, yellow, 3-6 inches long, smooth or hairy. Buds ovate to conical, strongly angled, gradually narrowed and obtuse at the apex, hoary-hairy, $\frac{1}{4}$ - $\frac{1}{2}$ inch long.

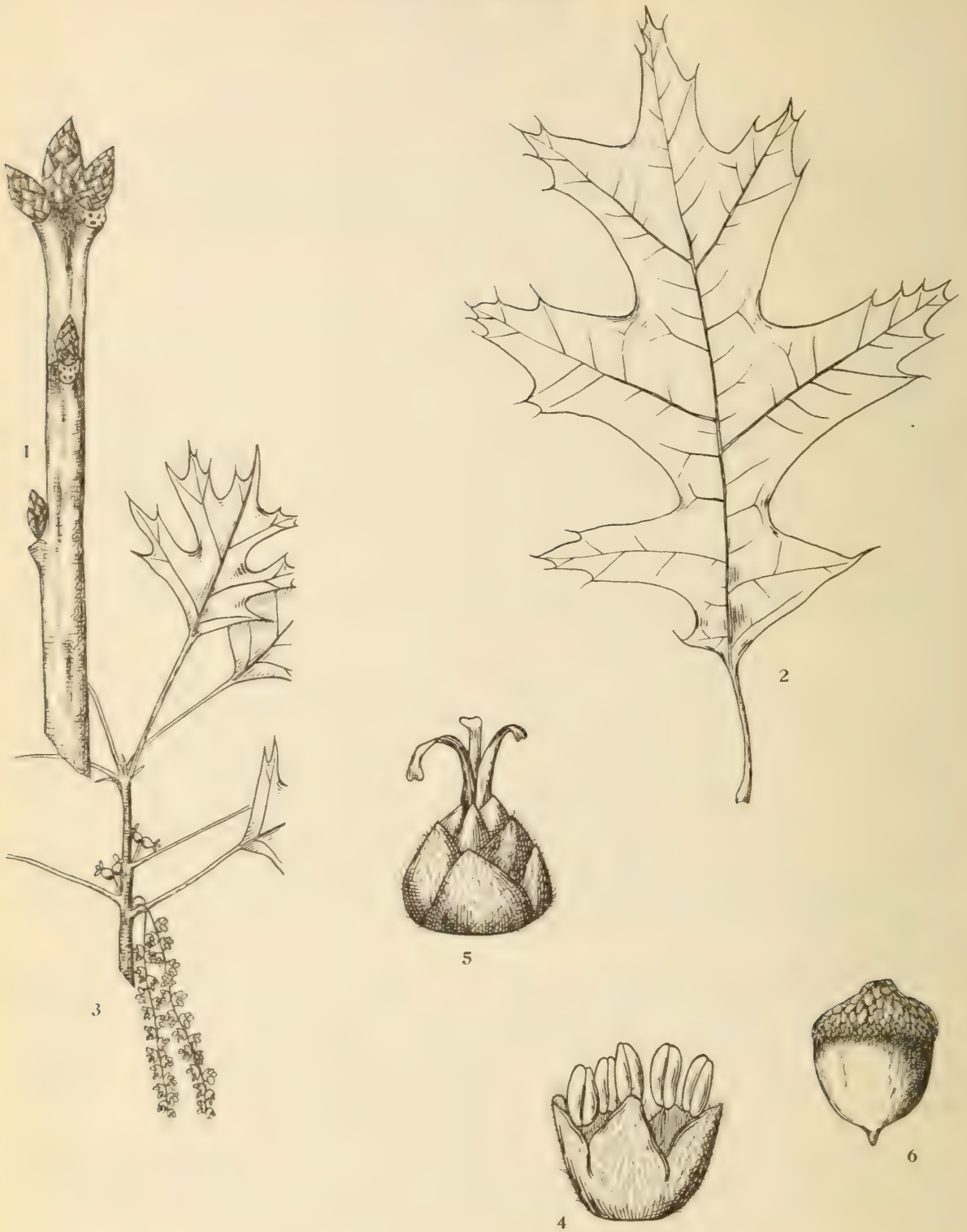
Flowers and Fruits: Flowers produced in May as the leaves are developing, the staminate in hairy catkins 4-6 inches long; calyx 3-4-lobed, lobes acute, reddish, hairy; corolla 0; stamens 4-5, yellow; pistillate flowers on short hairy stalks in the axils of the young leaves, solitary or in pairs, reddish; stigmas 3, divergent, red. Acorns maturing at the close of the second season, short-stalked or stalkless, solitary or in pairs; acorn thin; cup top-shaped or cup-shaped, inclosing about one-half of the acorn; scales of the cup thin, light or dark brown, hoary, downy on the inner surface; acorn $\frac{1}{2}$ - $\frac{3}{4}$ inch long, reddish-brown, often soft-hairy, especially below, ovate, oblong or hemispherical, broad and rounded at the base, full and rounded at the apex.

Bark, Twigs and Wood: Bark of young twigs at first scurfy scaly, later smooth, dark reddish-brown, or mottled gray, thick and nearly black on old trunks, deeply furrowed and often scaly with closely appressed, plate-like scales; inner bark thick, yellow, very bitter, abounds in tannic acid. The wood is hard, heavy, strong, coarse-grained, bright red-brown with thin, paler sapwood, of little value except as fuel.

Distribution in the State: Black oak is fairly common in the Missouri forests from which it has entered this state at the southeastern corner and is now found along the Missouri river and the lower courses of its tributaries to the mouth of the Platte in Cass county.

Remarks: This species is one of the most puzzling of all of the oaks because of the variability of the leaves, but it is readily distinguished from the other oaks by the bright yellow color of the inner bark, by the deep red color of the unfolding leaves which become pale and silvery in a few days and by the large, hairy winter buds.

PIN OAK. SWAMP OAK



1. Winter twig, x 2.
2. Leaf, x $\frac{1}{2}$.
3. Flowering flower, enlarged.
4. Staminate flower, enlarged.
5. Pistillate flower, enlarged.
6. Fruit, x $\frac{1}{2}$.

(From Otis: Mich. Trees)

PIN OAK. SWAMP OAK

Quercus palustris Du Roi

The Oak Family

FAGACEAE

Habit and Habitat: A small to medium-sized tree, 70-80 feet tall, with a trunk diameter of 2-3 feet, but commonly much smaller than this, 40-50 feet tall and 1-2 feet in diameter; slender branches forming an oblong or rounded or pyramidal crown, becoming open and irregular, with rigid and pendulous branches furnished with small, tough, drooping branchlets. Prefers borders of swamps and river bottoms in moist, rich soil, but may be cultured successfully elsewhere.

Leaves and Buds: Leaves alternate, simple, 4-6 inches long, 2-4 inches wide, obovate to ovate or broadly oval in outline, base wedge-shaped, 5-7-lobed by deep, wide, rounded indentations, the lobes few-toothed, the teeth bristle-pointed, terminal lobe usually 3-toothed toward the apex, pale reddish-green as they unfold from the bud, shining and hairy above, covered with whitish, scurfy down beneath, becoming thin and firm, dark, shining green above, pale green beneath, turning deep scarlet in the late autumn before they fall. Petioles yellowish, slender, $\frac{1}{2}$ -2 inches long. Winter-buds chestnut brown, ovate acute, or conical, $\frac{1}{8}$ inch long, smooth or slightly hairy toward the apex.

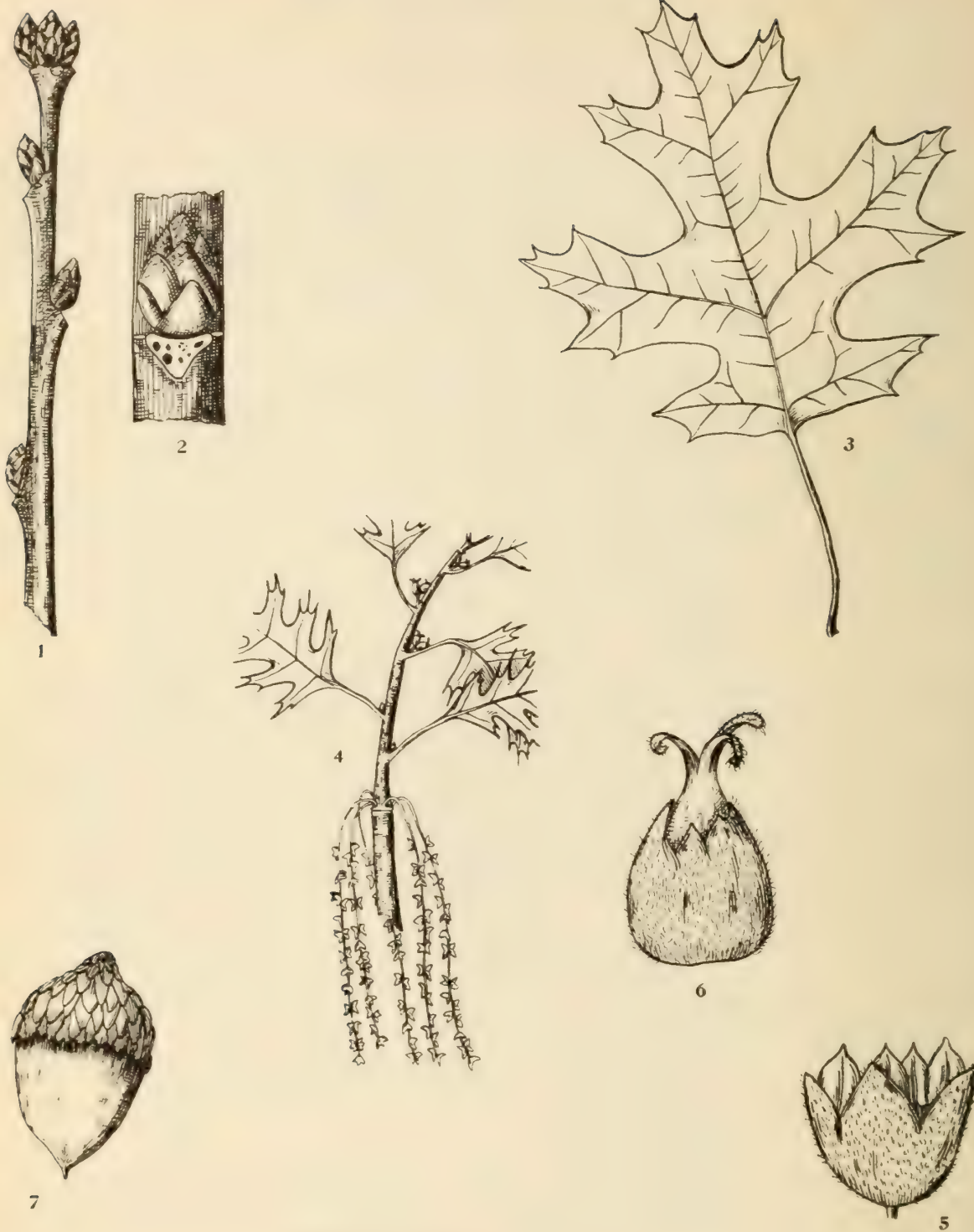
Flowers and Fruits: Flowers produced in May when the leaves are about half grown. Staminate flowers borne in slender, drooping, hairy catkins 2-3 inches long; calyx hairy, 4-5-lobed; stamens 4-5, yellow. Pistillate flowers borne on short hairy stalks in the axils of the young leaves, hairy; stigmas bright red, recurved. The acorns mature at the close of the second season's growth, borne on short stalks or stalkless, solitary or clustered; acorn flattish, nearly hemispherical, about $\frac{1}{2}$ inch in diameter, light brown, inclosed only at the base by the thin, saucer-shaped cup; cup dark brown and shiny within and covered with closely overlapping, thin reddish-brown more or less hairy scales.

Bark, Twigs and Wood: Bark of young trunks and branches smooth, shiny, light brown, frequently tinged with red, becoming on old branches and trunks thick, light grayish-brown, generally smoothish or covered by small, closely appressed scales; the young twigs are dark red and more or less hairy at first, becoming shiny, green and finally gray-brown. The wood is heavy, hard, strong, coarse-grained, light brown, with thin darker-colored sapwood; sometimes used in construction, for shingles and fence posts.

Distribution in the State: Pin oak does not occur naturally in Nebraska, but it occurs in north central Missouri and eastern Kansas so that we may expect it to wander into our state some day via the southeastern corner.

Remarks: This species is one of the finest of all of our American oaks for street and ornamental planting. It grows rapidly and uniformly, and it may be easily transplanted. Its shiny, deeply lobed leaves are beautiful in summer and particularly fine when the autumn tints appear. Many small branchlets seen at a distance give the impression of the tree being full of coarse pins, hence the common name.

SCARLET OAK



1. Winter twig, x 1.
2. Portion of twig, enlarged.
3. Leaf, x $\frac{1}{2}$.
4. Flowering branchlet, x $\frac{1}{2}$.
5. Staminate flower, enlarged.
6. Pistillate flower, enlarged.
7. Fruit, x 1.

(From Otis: Mich. Trees)

SCARLET OAK

Quercus coccinea Moench.

The Oak Family

FAGACEAE

Habit and Habitat: A tree, 30-50 feet tall, with a trunk diameter of 12-15 inches, occasionally somewhat larger; the long, slender branches form an open, rounded oblong, or often irregular crown, depending upon the closeness of its association with other trees. Usually found in light, comparatively dry, sandy or gravelly soils, upon slopes and hills.

Leaves and Buds: The leaves are alternate, simple, 3-6 inches long, 2½-4 inches broad, broadly ovate or oval, wedge-shaped or straight at the base, deeply 5-9-lobed by wide, rounded indentations, the lobes toothed and bristle-tipped, when very young bright red and covered with loose felty hairs above, and silvery-white beneath, becoming at maturity thin and firm, shiny, bright green above, paler and less shiny and smooth beneath, turning brilliant scarlet late in the autumn; petioles slender, 1-2 inches long. Winter buds oval or ovate, gradually narrowed toward the acute apex, ⅛-¼ inch long, dark reddish-brown, and covered with pale hairs above the middle.

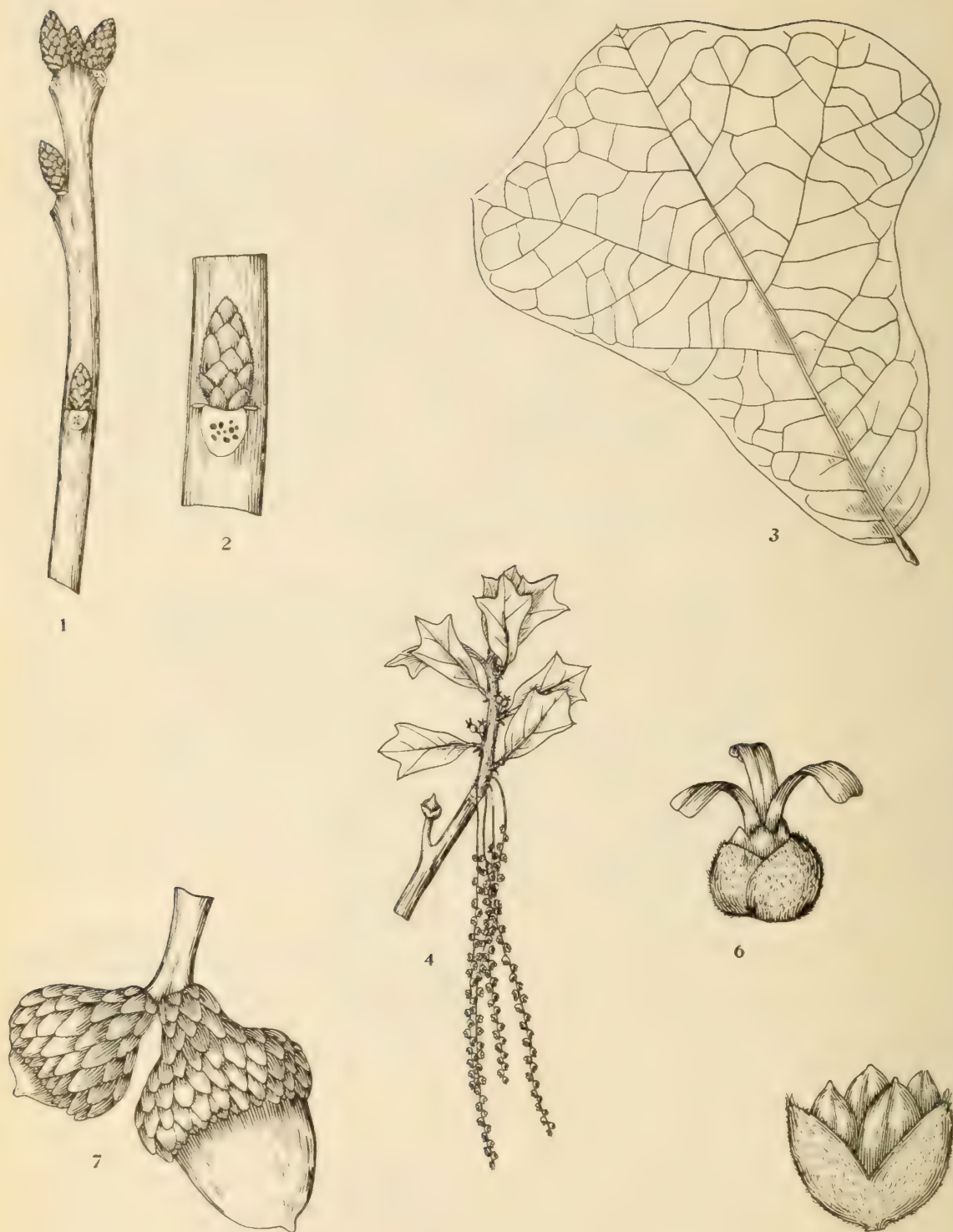
Flowers and Fruits: Flowers appearing in May as the leaves are developing, the staminate in catkins. Staminate flowers in smooth, slender, drooping catkins 3-4 inches long; calyx hairy, bright red before opening, 4-5-lobed with ovate, acute segments; stamens usually 4, yellow. Pistillate flowers few, on hairy stalks ½ inch long, in the axils of the young leaves, bright red, hairy; stigmas long, spreading, hairy, bright red. Fruit ripening in the autumn of the second growing season, solitary or pairs, short-stalked; acorn oval, oblong, or rarely hemispherical, flat or rounded at the base, rounded at the apex, ½-1 inch long, ⅓-⅔ inch broad, light reddish-brown, inclosed for one-third to one-half its length in the acorn cup; cup top-shaped or cup-shaped, with closely overlapping, red-brown scales which are more or less hairy. Kernel bitter, not edible.

Bark, Twigs and Wood: The twigs are at first coated with scurfy-scales, soon becoming pale green, smooth, shiny, and light brown; bark on old branches dark brown and smooth, on main trunk becoming dark gray or brown, ½-1 inch thick and divided by shallow fissures into irregular ridges covered by small, light brown scales tinged with red, not bitter. Wood hard, heavy, strong, coarse-grained, light or reddish-brown, with thick, darker brown sapwood.

Distribution in the State: The scarlet oak is a very common forest tree throughout northeastern United States from Michigan to northern Georgia and from Maine to Iowa and Missouri. It has entered the southeastern corner of this state from Missouri forests and has spread along the river from Richardson county as far northward as Cass county. Map 16.

Remarks: The scarlet oak is one of the more rapidly growing oaks and it is one of our better trees for ornamental planting, being fully as desirable as the red oak for this purpose. The wood is largely used in the manufacture of furniture, for interior trim and for fuel; it is not distinguished from red oak wood commercially. The wood is also fine for fuel.

BLACK JACK OAK



1. Winter twig, x 1.
2. Portion of twig, enlarged.
3. Leaf, x $\frac{1}{2}$.
4. Flowering branchlet, x $\frac{1}{2}$.
5. Staminate flower, enlarged.
6. Pistillate flower, enlarged.
7. Fruit, x 1.

(From Otis: Mich. Trees)

BLACK JACK OAK
Quercus marilandica Moench.

The Oak Family
FAGACEAE

Habit and Habitat: A small to medium sized tree, 20-30 feet high, with a trunk diameter of 4-14 inches, or occasionally 40-50 feet high and 18-24 inches in diameter, more frequently a tall shrub, the more or less twisted and spreading branches forming an ovoid or rounded crown, often with drooping lower branches. Black Jack is found as a rule in dry and more or less barren sites.

Leaves and Buds: Leaves alternate, simple, 4-7 inches long and about the same in width, broadly-obovate, more or less shallowly 3-lobed at the tip, the lobes entire or toothed, bristle-tipped, very variable in size and shape, thick and firm, more or less leathery, dark yellow green and very shiny above, yellow, orange color or brown and scurfy-hairy beneath, turning brown or yellow in the autumn before falling; petioles stout, yellow, smooth or hairy, $\frac{1}{2}$ - $\frac{3}{4}$ inch long. Buds ovate or oval, prominently angled, light reddish-brown, rusty-hairy, about $\frac{1}{4}$ inch long.

Flowers and Fruits: Flowers produced in May with the leaves, the staminate in catkins. Staminate catkins slender, hoary, 2-4 inches long; calyx thin and papery, 4-5-parted, tinged with red, pale hairy on the outer surface; stamens ending in a short-pointed tip, dark red. Pistillate flowers borne on short rust-hairy stalks, coated with thick rusty down, in the axils of the leaves; stigmas dark red, recurved. The acorns solitary or in pairs, maturing at the end of the second season, short-stalked; acorn cup top-shaped, with large, reddish-brown, rusty-hairy scales, inclosing one-half to two-thirds of the nut or acorn; acorn about $\frac{3}{4}$ inch long, oblong, full and rounded at the ends, rather broader below than above the middle, yellowish-brown, kernel yellowish, not edible.

Bark, Twigs and Wood: The bark on the main trunk is 1-1 $\frac{1}{2}$ inches thick, deeply furrowed into nearly square plates 1-3 inches long covered with small closely appressed, dark brown or nearly black scales. Stout branchlets at first covered with a thick, pale coat of hairs, light brown and scurfy-scaly during the first summer, becoming reddish-brown and more or less smooth the first winter and finally brown or ashy gray. The wood of black jack is hard, heavy, strong, tough, dark brown, with thick lighter colored sapwood; largely used for fuel and in the manufacture of charcoal. Map 15.

Distribution in the State: Black jack is rather common throughout eastern United States south of New York and Michigan and extending westward to eastern Texas, Oklahoma, Missouri and Iowa. The species has barely entered the southeastern corner of Nebraska and has moved from Richardson county to Nemaha and Pawnee counties. This is an interesting illustration of a tree, common farther eastward, which has just reached Nebraska.

Remarks: The peculiar dark green, glossy, un-oak-like leaves, clustered at the tips of the twigs and the fine scaly bark should help in the sure identification of this species which is always a low scrubby tree with us. I shall welcome specimens of this species for our herbarium.

WHITE OAK



1. Winter twig, x $1\frac{1}{2}$.
2. Leaf, x $\frac{1}{2}$.
3. Flowering branchlet, x $\frac{1}{2}$.
4. Staminate flower, enlarged.
5. Pistillate flower, enlarged.
6. Fruit, x 1.

(From Otis: Mich. Trees)

WHITE OAK
Quercus alba L.

The Oak Family
FAGACEAE

Habit and Habitat: A large tree, 60-80 feet tall, or even taller, with a trunk diameter of 12-36 inches; trunk usually short and thick, with stout, spreading limbs and coarse branches which often become gnarled and twisted in old age; crown usually broad and open. Does very well in many sites except in very wet soils.

Leaves and Buds: Leaves alternate, simple, 5-9 inches long, 3-4 inches wide, obovate to oblong, 7-9-lobed, commonly 7-lobed, with rounded lobes and rounded indentations, sometimes the indentations are deep, sometimes shallow; lobes usually entire, thin and firm, smooth and bright green above, pale or grayish beneath, often remaining upon the tree throughout the winter, turning deep red in late autumn; petioles short, stout, grooved, flattened. Buds reddish-brown, obtuse, ovoid, $\frac{1}{4}$ inch long, terminal bud $\frac{1}{4}$ inch long; scales smooth.

Flowers and Fruits: Flowers produced in May when the leaves are about one-third grown; staminate in hairy catkins 2-3 inches long; calyx bright yellow, hairy, 6-8-lobed; stamens 6-8, yellow; pistillate flowers borne on short, stout stalks, reddish, hairy; calyx bell-shaped; stigmas bright red. Fruit a short-stalked or stalkless acorn, with a shallow cup; cup with small, brown-hairy scales, inclosing about one-fourth of the nut, nut or acorn oblong-ovoid, rounded at the tip, about $\frac{3}{4}$ inch long, light brown; kernel sweet and edible, ripening in the autumn of the first year.

Bark, Twigs and Wood: Bark on large branches and the main trunk gray, varying to dark gray and to almost white in some cases, broken into broad flat ridges by shallow fissures; twigs at first bright green, hairy, later reddish-green and finally light gray. The wood is very heavy, hard, strong, tough, close-grained, durable, light brown with thin light brown sapwood, durable in contact with the soil, but likely to check unless carefully seasoned.

Distribution in the State: The white oak occurs throughout eastern United States except in eastern Florida and has extended its range westward in the forests of Missouri and Kansas from which it has entered Nebraska in the extreme southeastern corner, and has followed the Missouri river northward as far as Cass county. However, it is not abundant in any portion of its narrow range in our state. Map 14.

Remarks: The white oak is the most highly prized of all of the many species of North American oaks. It is esteemed as an ornamental tree on account of its sturdiness, its magnificent spreading form, its beautiful autumn tints, and its long life. The wood of white oak is of great value because of its adaptability to a great many diverse uses where a tough, strong and beautifully grained wood is demanded. The wood is largely used in shipbuilding, construction, furniture, interior trim, cooperage, casks, barrels, kegs, tubs, agricultural implements, carriages, flooring, cabinet making, tool handles, railway ties, fence posts and fuel.

SWAMP WHITE OAK



1. Winter twig, x 2.
2. Leaf, x $\frac{1}{2}$.
3. Flowering branchlet, x $\frac{1}{2}$.
4. Staminate flower, enlarged.
5. Pistillate flower, enlarged.
6. Fruit, x 1.

(From Otis: Mich. Trees)

SWAMP WHITE OAK

Quercus bicolor Willd.

The Oak Family

FAGACEAE

Habit and Habitat: A medium-sized tree, 40-70 feet tall, with a trunk diameter of 12-30 inches, usually smaller with us; the open, round-topped rugged crown is formed of many tortuous, pendulous branches and short, stiff, bushy spray. Prefers rich, moist soil such as it finds along streams and bordering swamps, hence the common name.

Leaves and Buds: Leaves alternate, simple, 5-7 inches long, obovate to oblong-obovate, gradually narrowed and wedge-shaped at the base, margin coarsely, wavy-toothed or shallow-lobed, the lobes and indentations rounded, thick and firm, dark green and shiny above, whitish and more or less hairy beneath, yellow in the autumn. Petioles stout, $\frac{1}{2}$ inch long, grooved, flattened. Buds pale, chestnut-brown, broadly ovoid to globose, obtuse, scales long-hairy especially above the middle, $\frac{1}{8}$ - $\frac{1}{4}$ inch long.

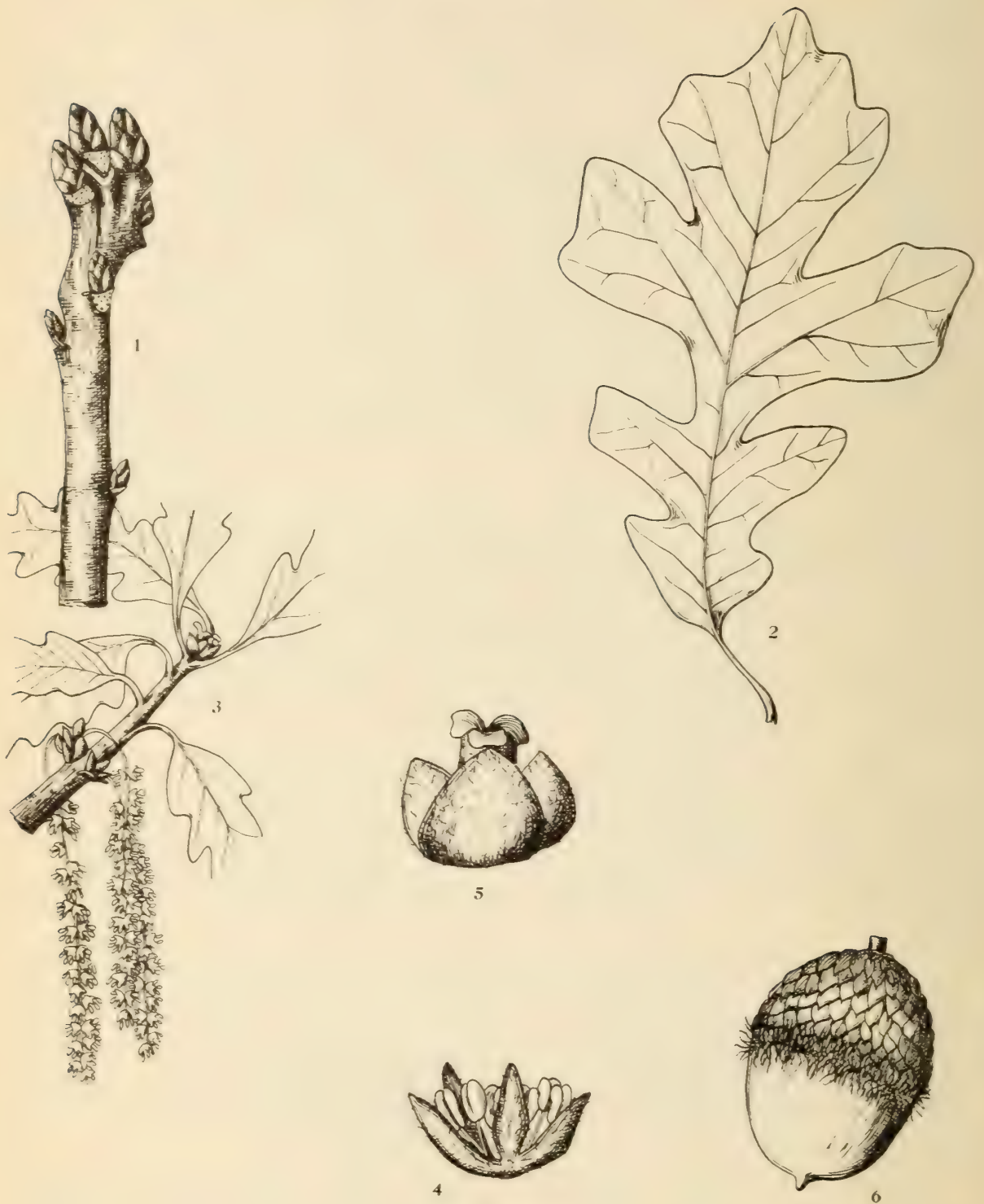
Flowers and Fruits: Flowers produced in May when the leaves are about half grown; staminate in drooping, hairy catkins 3-4 inches long; calyx yellow-green, 5-9-lobed, hairy, stamens 5-8, yellow; pistillate flowers hairy, borne singly or in few-flowered, inconspicuous clusters, upon short stalks in the axils of the young leaves, rusty-hairy; stigmas red. Acorns on long, pubescent stalks, often in pairs, stalks 1-4 inches long; cup cup-shaped, with more or less loose, light brown scales, inclosing one-third of the nut or acorn; nut ovoid, light brown, hairy at the tip, about 1 inch long, kernel white, edible.

Bark, Twigs and Wood: Bark gray-brown, deeply fissured into broad, flat, scaly ridges; branches greenish-gray; twigs at first smooth, shiny, green, becoming reddish-brown, finally dark brown and sometimes separating into papery, curly scales. Wood hard, heavy, tough, strong, coarse-grained, light brown with thin, scarcely distinguishable sapwood, checks in drying; used for about the same purposes as white oak.

Distribution in the State: This is another one of our rare native oaks which has come into Nebraska from the forests of Iowa and Missouri where it is more or less common. The swamp white oak is not very common or abundant anywhere although it is found throughout the northern United States and southeastern Canada east of Nebraska and Kansas. It has entered the southeastern corner of our state and has become distributed from Richardson county northward along the Missouri river to Cass county. Map 20.

Remarks: The swamp white oak is quite rare in the restricted range of the species in this state and further investigation is necessary to clearly establish its farthest point of penetration. It is a fine illustration, which is also shown by many other eastern trees which have barely entered Nebraska, of the behavior of a plant on the limits of its range, and it portrays many interesting lessons concerning the ecological relations between different species of plants and between different types of plant associations. The wood of this species quite closely resembles that of white oak and bur oak from which it is not distinguished commercially. I shall welcome herbarium material of this species from this state.

BUR OAK



1. Winter twig, x 2.
2. Leaf, x $\frac{1}{3}$.
3. Flowering branchlet, x $\frac{1}{2}$.
4. Staminate flower, enlarged.
5. Pistillate flower, enlarged.
6. Fruit, x 1.

(From Otis Mich. Trees)

BUR OAK

Quercus macrocarpa Michx.

The Oak Family

FAGACEAE

Habit and Habitat: A large tree, much like the white oak, with a height of 60-80 feet or even of 100 feet and a trunk diameter of 1½-4 feet; the great, spreading branches forming a broad, open, rugged crown; in very dry upland soils becoming dwarfed to the stature of shrub, then called "scrub oak". Prefers the moist, rich, loam soils of river bottom-lands and wooded slopes, but is tolerant of many different conditions of soil and climate.

Leaves and Buds: Leaves alternate, simple, 6-10 inches long, 3-5 inches wide; obovate to oblong, wedge-shaped at the base, coarsely and deeply lobed, sometimes almost to the midrib, thick and firm, dark green and shiny above, pale and hairy beneath; lobes 5-7, rounded, indentations rounded, the terminal lobe largest, oval or obovate in outline. Petioles short, stout, flattened and grooved, enlarged at the base. Leaves falling in the autumn. Terminal bud ⅛ inch long, broadly conical, hairy, light reddish-brown.

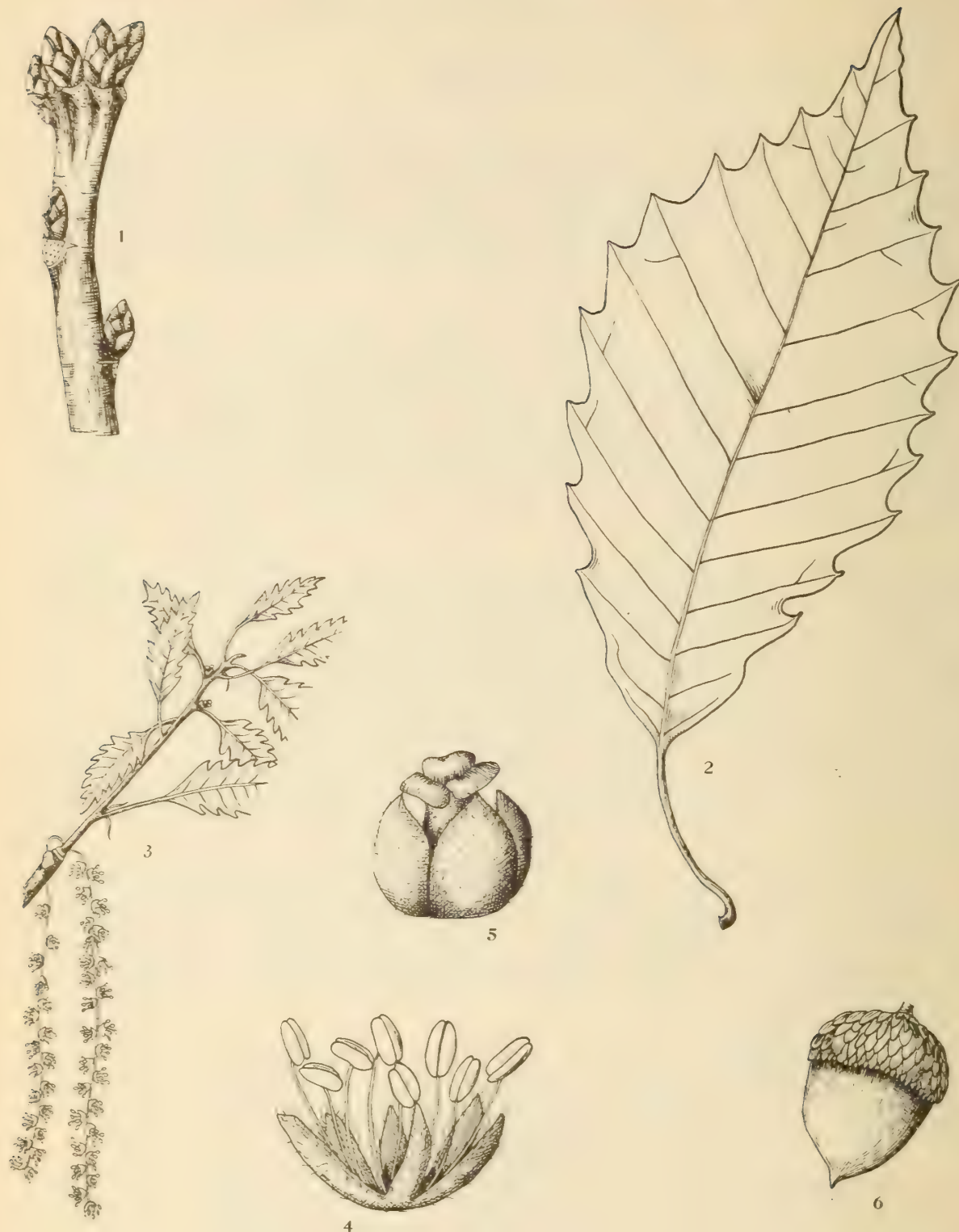
Flowers and Fruits: Flowers produced in May when the leaves are about one-third grown; staminate in long, slender, drooping, hairy, catkins 4-5 inches long, in loose clusters from last season's twigs; calyx yellow-green, 4-6-lobed, downy; stamens 4-6, yellow; pistillate flowers inconspicuous, short-stalked or stalkless, in groups of 1-4 from buds upon the young shoots, reddish, hairy; stigmas bright red. Acorns commonly in pairs, short-stalked or stalkless, very variable in size and shape, ripening in the fall of the first year; cup typically deep, hairy, fringed with coarse, tortuous bristles, inclosing one-third to two-thirds of the acorn or nut; nut broad, ovoid, ½-1½ inches long, brownish, soft hairy; kernel or seed white, sometimes sweetish and edible.

Bark, Twigs and Wood: The young twigs are at first grayish or yellowish-brown, very hairy, becoming ashen or brownish; branches often with corky flanges; bark on the old branches and main trunk thick, deeply furrowed, grayish-brown and often more or less scaly, commonly a fine habitat for lichens. Wood brown with pale brown sapwood, hard, heavy, tough, strong, close-grained, coarse, very durable in contact with the soil.

Distribution in the State: Bur oak has entered our state in the southeast and has migrated more than half-way across the state. This is by far our commonest and most abundant native oak. It probably is more widely distributed than any other American oak. Map 12.

Remarks: The bur oak is without doubt the finest and safest of native oaks for wide planting in this state. It produces a magnificent tree, long-lived and very resistant to the rather trying conditions imposed by our climate. It may be planted in practically all parts of the state, but in the extreme west it may need some water during the driest summer weeks. It is not only a fine ornamental but it is also one of the finest timber trees of the United States. The wood of the bur oak is commonly not distinguished from that of the white oak in commerce and it is widely used for the same purposes. The trees often occur in pairs, due to the production of acorns in pairs. This is one of our very best post and fuel woods.

YELLOW OAK. CHESTNUT OAK



1. Winter twig, x 2.
2. Leaf, x $\frac{1}{2}$.
3. Flowering branchlet, x $\frac{1}{2}$.
4. Staminate flower, enlarged.
5. Pistillate flower, enlarged.
6. Fruit, x 1.

(From Otis: Mich. Trees)

YELLOW OAK. CHESTNUT OAK

Quercus acuminata (Michx.) Sarg.

The Oak Family

FAGACEAE

Habit and Habitat: A medium-sized tree, 40-50 feet tall, with a trunk diameter of 1-3 feet, or considerably taller and larger of trunk farther eastward as along the Wabash river in southern Indiana; numerous, comparatively small branches form a narrow, rounded crown, or more or less low and bushy, on this its western limit. Prefers a limestone soil, but occurs upon dry hillsides and sunny slopes in various soils, also found in rich bottom-lands and along rocky river-banks.

Leaves and Buds: The leaves are alternate, simple, 4-7 inches long, 1-4 inches wide, oblong or lanceolate, wedge-shaped or rounded at the base, coarsely toothed, the teeth acute or rounded, each tipped with a small glandular point, thick and firm, bronze-green and hairy as they unfold from the bud, but when full grown or mature are yellow-green and shiny above, pale, often silvery white and downy beneath, turning deep yellow and scarlet in the autumn. Petioles slender, about 1 inch long, slightly flattened. Winter-buds pale chestnut-brown, $\frac{1}{4}$ - $\frac{1}{4}$ inch long, conical, acute, more or less hairy, margin of the scales hairy-fringed.

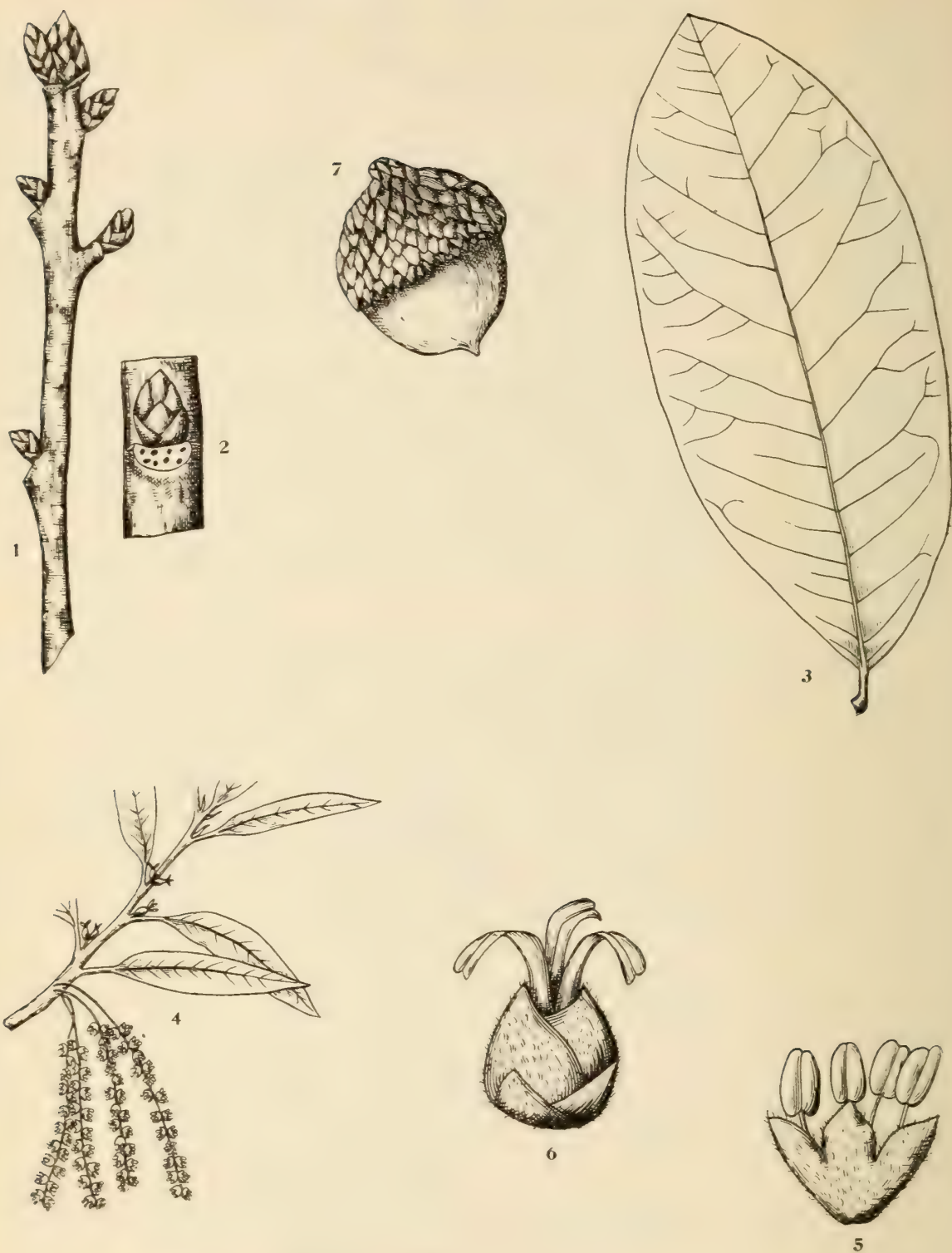
Flowers and Fruits: Flowers produced in May when the leaves are about one-third grown. Staminate flowers borne in slender, hairy catkins 3-4 inches long; calyx light yellow, hairy, deeply 6-8-parted; stamens 5-8, yellow. Pistillate flowers stalkless or borne in short, few-flowered clusters in the axils of the leaves, hoary-hairy, calyx bell-shaped, 5-8-lobed, yellow; stigmas bright red. The fruits or acorns mature at the end of the first season and are borne in short-stalked or stalkless pairs or singly, acorn or nut oval or ovate, rounded and rather obtuse or pointed at the apex, bright chestnut-brown, about $\frac{3}{4}$ inch long, inclosed for about one-half the length in the thin, cup-shaped, light brown cup; cup hairy on the interior, hoary on the exterior and covered by small obtuse scales; kernel or seed sweet, sometimes edible.

Bark, Twigs and Wood: Bark light, silvery gray or ash-colored and flaky on the main trunk, usually less than $\frac{1}{2}$ inch thick; the young twigs green or more or less tinged with red or purple, and hairy when they first appear, light orange color or gray-brown through the first winter, finally becoming gray. Wood very hard, heavy, strong, close-grained, durable, dark brown, with thin, pale sapwood; largely used in cooperage, for wheels, railway ties, fence posts and fuel.

Distribution in the State: Common in the forests of Missouri from which it has followed the Missouri river into Nebraska and has become established along that river in Richardson and Nemaha counties. Map 19.

Remarks: This species is called "chestnut oak" from the resemblance of the leaves to those of the true chestnut of eastern United States. Still another chestnut oak closely related to this species, also occurs in about the same localities in the state. This is *Quercus prinoides* Willd.; it is usually a smaller tree than the above species and of less importance, but the two may be quite easily confused since the leaf types of the two are very much alike.

SHINGLE OAK. LAUREL OAK



1. Winter twig, x 1.
2. Portion of twig, enlarged.
3. Leaf, x $\frac{1}{2}$.
4. Flowering branchlet, x $\frac{1}{2}$.
5. Staminate flower, enlarged.
6. Pistillate flower, enlarged.
7. Fruit, x 1.

(From Otis: Mich. Trees)

SHINGLE OAK. LAUREL OAK

Quercus imbricaria Michx.

The Oak Family

FAGACEAE

Habit and Habitat: A medium-sized tree, 40-50 feet tall, with a trunk diameter of 1-2 feet, or occasionally in most favorable sites in the forest reaching a height of 100 feet and developing a straight, columnar trunk 3-4 feet in diameter; the slender, tough, horizontal or somewhat pendulous branches form a narrow, rather open crown. Prefers rich uplands and the moist, fertile soils of river-bottoms and wooded ravines.

Leaves and Buds: Leaves alternate, simple, 4-6 inches long, 1-2 inches wide, oblong-lanceolate to oblong-obovate, abruptly pointed or rounded at the apex, gradually narrowed and wedge-shaped or rounded at the base, margin entire, slightly thickened or undulate, rarely more or less 3-lobed, thin, bright red when unfolding from the bud, soon becoming yellow-green, shiny above, paler and more or less hoary-hairy beneath, at maturity smooth, dark, shining green above and pale green or brown and more or less hairy beneath, turning dark red on the upper surface in the autumn; petioles stout, $\frac{1}{2}$ inch long, hairy. Winter-buds ovate, acute, about $\frac{1}{8}$ inch long, obscurely angled, covered by closely overlapping, light chestnut-brown scales which are often fringed with fine hairs.

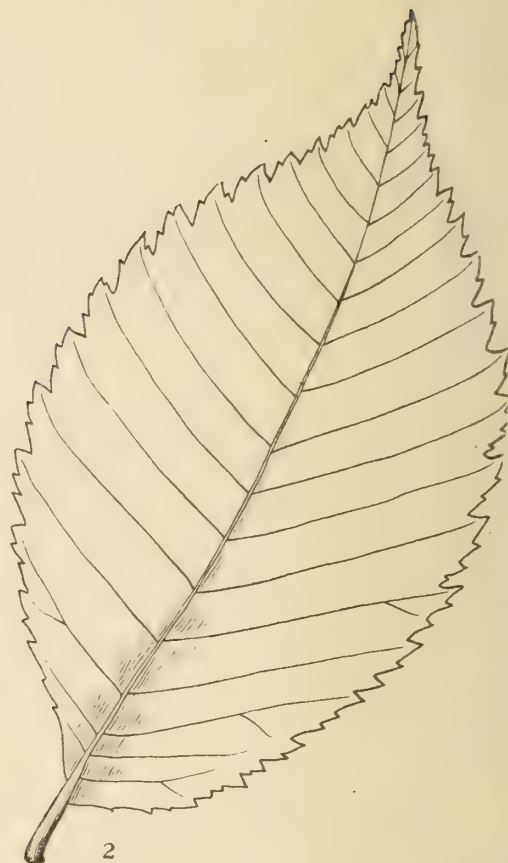
Flowers and Fruits: Flowers appearing in May with the leaves. The staminate flowers in slender, hoary-hairy, drooping catkins 2-3 inches long; calyx light yellow, hairy, 4-lobed; corolla 0; stamens 4-5, yellow. Pistillate flowers singly or in pairs in the axils of the leaves, borne upon slender, hairy stalks, pale hairy; calyx 4-5-lobed; corolla 0; stigmas greenish-yellow, recurved. Acorns ripening in the fall of the second season, borne by stout peduncles about $\frac{1}{2}$ inch long, solitary or in pairs; acorn about $\frac{1}{2}$ inch long, nearly as broad, full and rounded at the ends, globose, dark chestnut-brown, inclosed for one-third to one-half its length in the thin, cup-shaped or top-shaped cup which is bright reddish-brown and shiny on the inner surface, and covered by thin ovate, light reddish-brown scales which are hairy-margined. Kernel very bitter.

Bark, Twigs and Wood: The bark on young stems and branches thin, dark green, later light brown, smooth, shiny, becoming on old trunks thick, and divided by irregular, shallow fissures into broad ridges covered with close-fitting brownish scales. The wood is hard, heavy, rather coarse-grained, light brown tinged with red, with thin, lighter colored sapwood; occasionally used in construction and for shingles, less commonly for interior trim and furniture.

Distribution in the State: This interesting oak has been repeatedly reported from southeastern Nebraska but we do not have any authentic specimens in the herbarium which were collected in this state. The species is doubtless to be found in Richardson county. It is said to be one of the most abundant oaks of the lower Ohio river valley and the state of Missouri. Map 17.

Remarks: The shingle oak is a very handsome tree and one which should be used more commonly as an ornamental. The large, entire leaves are, of course, the most clearly distinguishing feature of the species among all other American oaks.

WHITE ELM. AMERICAN ELM



1. Winter twig, x 2.
2. Leaf, x $\frac{1}{2}$.
3. Flowering branchlet, x $\frac{1}{2}$.
4. Flower, enlarged.
5. Fruit, x 2.

(From Otis: Mich. Trees)

WHITE ELM. AMERICAN ELM

Ulmus americana L.

The Elm Family

ULMACEAE

Habit and Habitat: A large tree, 40-70 feet tall and with a trunk diameter of 24-36 inches in our state; the trunk commonly divides 10-25 feet above the ground into a few (2-5) large, graceful branches which rise upward and outward to form a crown with a broad, vase-shaped outline, more rarely a rounded crown. Prefers deep, rich, moist loamy soils of river-banks and bottom-lands, but grows fairly well even in rather dry, rocky situations.

Leaves and Buds: Leaves alternate, simple, 3-5 inches long, one-half as broad, oblong to oval, coarsely and doubly serrate, thick and firm, lateral veins prominent and approximately parallel, dark green and rough above, pale and smooth or somewhat hairy beneath, often very oblique or unsymmetrical at the base; petioles short and stout. Winter buds prominent, ovoid, acute, flattened toward the twig, smooth, brown, $\frac{1}{8}$ inch long.

Flowers and Fruits: Flowers small, brown or red, usually produced in March before the leaves, perfect, borne on slender pedicels in loose clusters; calyx bell-shaped, 5-8-lobed; corolla 0; stamens 5-10, bright red; ovary broad, green; styles 2. Fruit maturing in May, a broad oval or ovate, 1-seeded structure with a flat, membranous wing about the seed; wing hairy-fringed and notched at the tip, produced in long-stemmed crowded clusters, often in great abundance.

Bark, Twigs and Wood: The young twigs are green and more or less downy, but become smooth, reddish-brown and finally ashen or gray; the bark on old trunks is thick, ashen-colored, and deeply fissured into broad, more or less scaly longitudinal ridges. Wood reddish-brown, sapwood pale brown, heavy, hard, strong, tough, rather coarse-grained, hard to split especially when dry; used for wheel hubs, saddletrees, cooperage and the cheaper grades of furniture, as well as for fence posts and fuel.

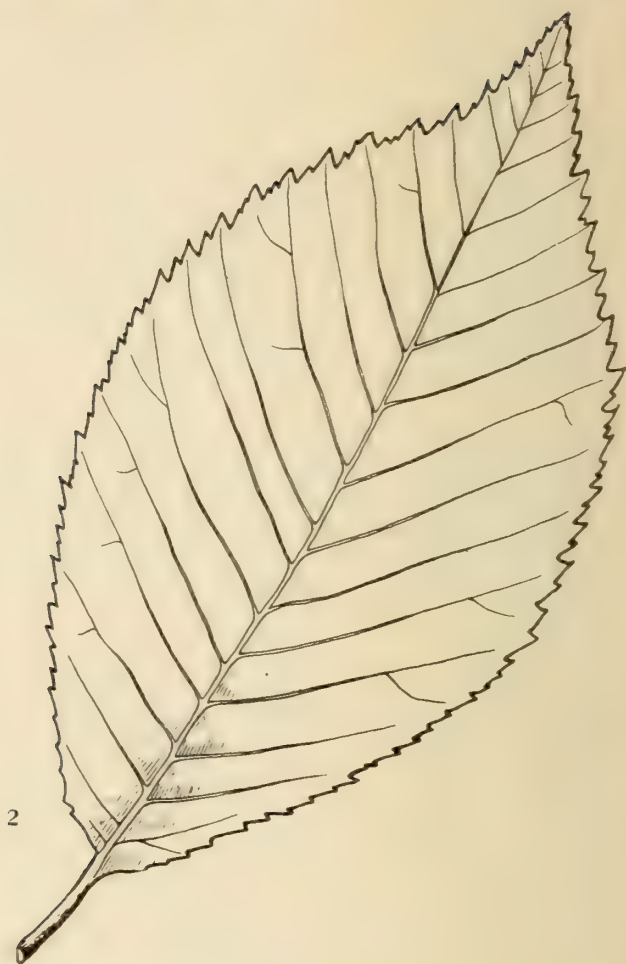
Distribution in the State: The white elm occurs throughout eastern United States where it is one of our famous and highly prized trees. It has extended into Nebraska from the forests of Iowa and Missouri and has become distributed entirely across the state. Some of the largest specimens of this species are found in the cool, moist canyons in the northern part of the state and in Sioux county, in the extreme north-western corner. It has also been planted more generally and more widely in all parts of the state as a street and ornamental tree than any other native or introduced species, with the possible exception of the common cottonwood. Map 30.

Remarks: The white elm is one of our historic American trees as is typified in the Washington elm in Cambridge, Massachusetts, and the William Penn elm in Philadelphia which was 233 years old at the time it was blown down in 1810. The peculiar toughness of the wood has been immortalized by Oliver Wendell Holmes in his "The Wonderful One-Hoss Shay" whose hubs were made from the "Settler's ellum". The tree grows rapidly and is long-lived. It is an ideal street and park tree, and one of the most beautiful of all American trees.

SLIPPERY ELM. RED ELM.



1



2



5



3



4

1. Winter twig, x 2.
2. Leaf, x 1.
3. Flowering branchlet, x 1.
4. Perfect flower, enlarged.
5. Fruit, x 1.

(From Otis: Mich. Trees)

SLIPPERY ELM. RED ELM

Ulmus fulva Michx.

The Elm Family

ULMACEAE

Habit and Habitat: A medium-sized tree, 30-50 feet high, with a short or tall trunk 12-25 inches in diameter; the trunk divides into 3-5 large, spreading, often more or less irregular branches which subdivide to form a broad, rounded or flat-topped open crown. Prefers the deep, rich, moist soil of stream banks and river bottoms, but also grows upon rocky slopes and ridges.

Leaves and Buds: Leaves alternate, simple, 2-6 inches long, about one-half as broad, oblong, or oval, abruptly pointed, coarsely and doubly serrate, often lop-sided at the base, thick and firm, dark green and rough above, paler and also rough beneath; petioles short, stout, and hairy. Winter buds prominent, ovoid, obtuse, dark brown, rusty-hairy, $\frac{1}{4}$ inch long, swelling prominently in early spring.

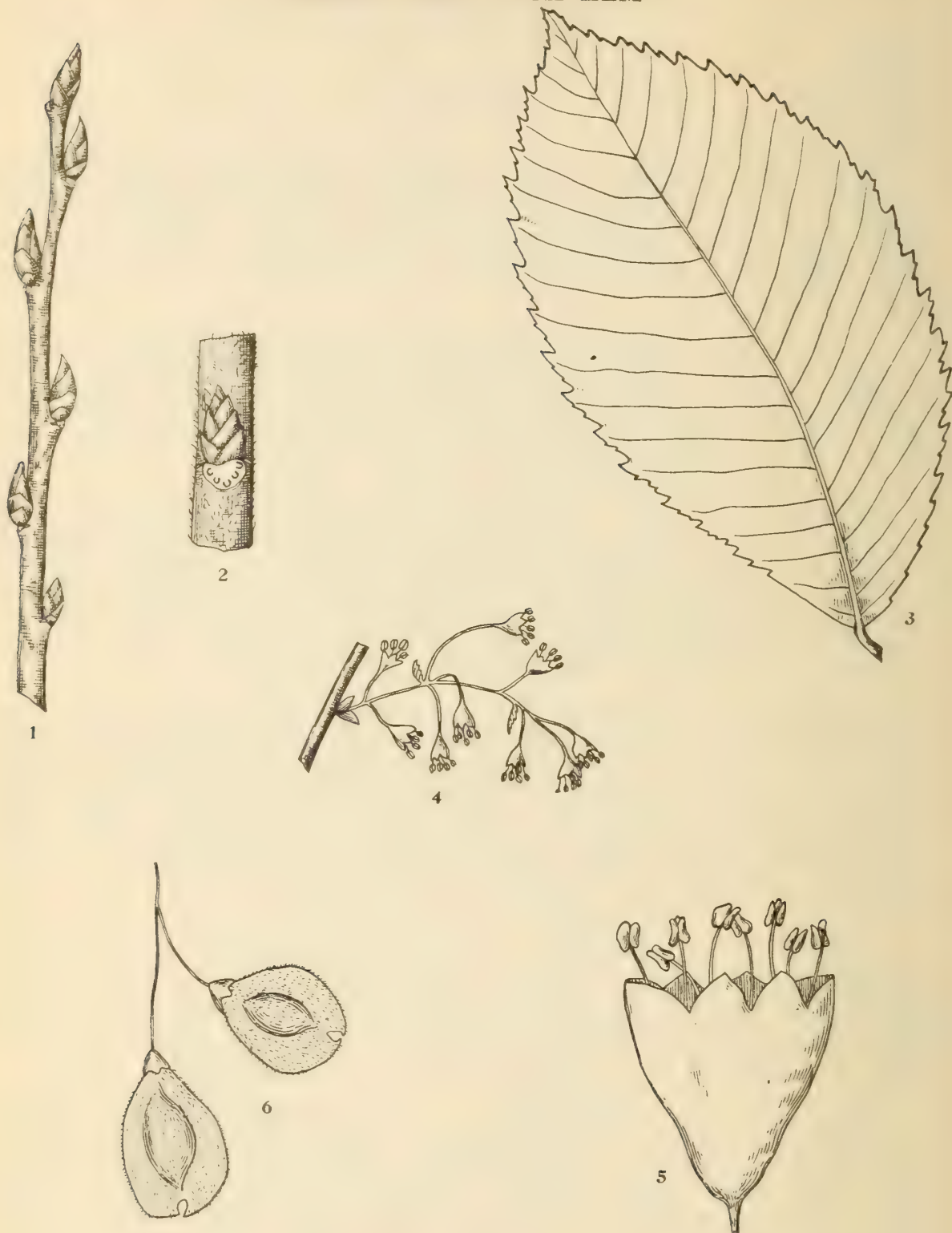
Flowers and Fruits: Flowers small, produced in March, before the leaves, perfect, borne on very short stalks in densely crowded clusters; calyx bell-shaped, 5-9-lobed, green, hairy; corolla 0; stamens 5-9, with dark red pollen sacs; stigmas 2, reddish purple. Fruit ripening in May, orbicular, 1-seeded, with a flat, broad, green-membranous wing surrounding the seed, $\frac{1}{2}$ - $\frac{3}{4}$ inch wide, seed brown-hairy, in dense greenish clusters, often mature before the leaves are full grown.

Bark, Twigs and Wood: Twigs are bright green at first and hairy, but become light brown to dark brown or grayish; dark reddish-brown and thick on old branches and the main trunk, fissured into large, irregular, longitudinal, loose plates, inner bark more or less gelatinous, hence the name "slippery elm". The wood is heavy, hard, tough, close-grained, durable, splitting easily when green but tough when dry, dark reddish-brown, with thin, lighter brown sapwood, durable in contact with the soil; useful for posts, poles, beams and fire wood.

Distribution in the State: One of the commonest forest trees of eastern United States which has worked its way about half way across Nebraska, and has been reported from as far west as Frontier county. Much more common and abundant along the Missouri river and the lower courses of its tributaries where it plays an important part in the broad-leaf woodlands. Planted widely beyond this natural range. Map 31.

Remarks: The slippery elm is one of the most abundant of all of our native forest trees in the natural forests in the eastern portion of the state. The large brown, broadly oval or conical, bluntly pointed, and hairy buds together with the orbicular, percussion-cap-like fruits and the aromatic mucilaginous inner bark will always serve to identify this particular species. A decoction made from soaking the inner bark in water is said to be beneficial in affections of the throat and lungs. A rapidly growing tree with cleanly habits and one of the best for street and lawn planting in this state. Very hardy, only prolonged drought affecting it seriously. Attacked by few serious pests in our state. The practice of shaving off the outer bark disfigures the tree, exposes it more seriously to injury from drought, in fact does the tree no good whatever.

CORK ELM. ROCK ELM



1. Winter twig, x 1.
2. Portion of twig, enlarged.
3. Leaf, x 1.
4. Flowering branchlet, x 1.
5. Flower, enlarged.
6. Fruit, x 1.

(From Otis: Mich. Trees)

CORK ELM. ROCK ELM

Ulmus racemosa Thomas

The Elm Family

ULMACEAE

Habit and Habitat: A large tree, often reaching a height of 100 feet in the east but usually not exceeding 50-60 feet in this state, with a trunk diameter of 18-30 inches. The lateral and lower branches exhibit a peculiar drooping habit so that a narrow oblong crown is formed. Found commonly on dry, rocky or gravelly uplands and sterile, clay ridges, also in moister, richer soils along with the other elms.

Leaves and Buds: Leaves alternate, simple, 2-5 inches long, oblong or oval, coarsely and doubly serrate, thick and firm, dark green and shining above, paler and more or less hairy beneath, base commonly oblique or unsymmetrical; petioles hairy, about $\frac{1}{4}$ inch long. Terminal bud absent; lateral buds ovoid, acute, chestnut-brown, hairy with long soft hairs.

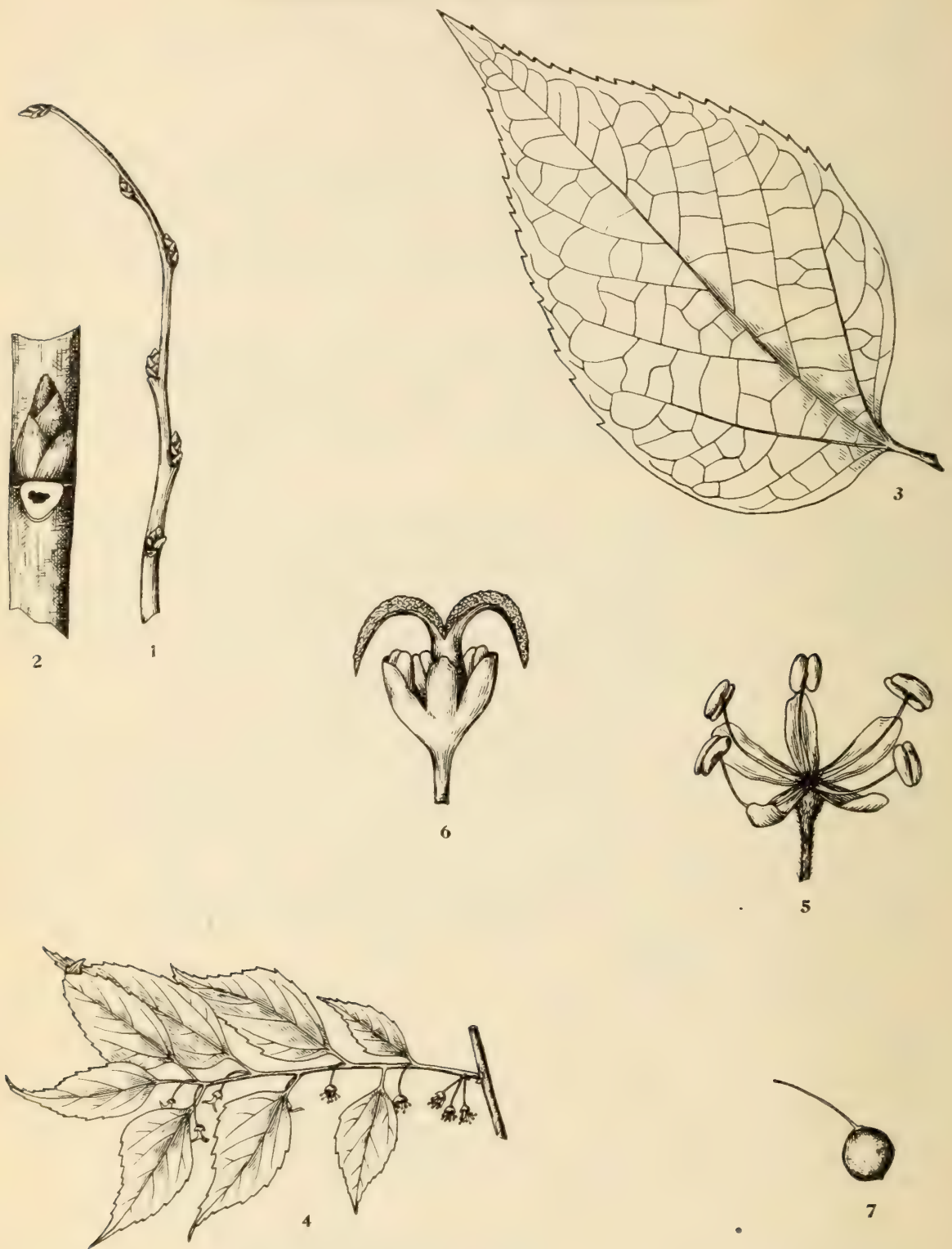
Flowers and Fruits: Flowers produced in March or April, before the leaves, perfect, greenish, borne upon slender pedicels in slender, loose, drooping clusters; calyx bell-shaped, 7-8-lobed; corolla 0; stamens 7-8, purplish; ovary squatty, hairy, with 2 style branches. Fruit a single seed with a hairy, flattish wing entirely surrounding it, $\frac{1}{2}$ inch long, borne in loose, drooping clusters on long, slender pedicels, ripe in May before the leaves are mature, wing of fruit narrow in proportion to the seed especially as compared with the red and white elms.

Bark, Twigs and Wood: The twigs are at first light brown and hairy, but soon become reddish-brown and shiny, finally dark brown or ashy gray, with corky, irregular ridges or wing-like flanges when about 2 years old; bark on old branches and main trunk gray, tinged with red, and divided by wide fissures into broad ridges which break up into broad flat scales on the surface. Wood heavy, very strong and tough, easy to work, takes a fine polish, light reddish-brown, with thick, lighter colored sapwood; used for agricultural implements, cabinet work, railway ties, bridge timbers, and sills.

Distribution in the State: The cork elm does not have as wide a range as the red and white elms, being found naturally from New York westward through southern Michigan to Illinois, Missouri and Nebraska. In this state the species has been reported only from two widely separated localities namely, Cass and Keya Paha counties, but it is highly probable that it occurs somewhat sparingly and perhaps intermittently along the eastern border of the state and for some distance westward from the mouth of the Niobrara river. Map 32.

Remarks: The cork elm is a very valuable tree because of the quality of its wood. It is sometimes called the hickory elm and often the cliff elm. The tree may be distinguished in the spring and early summer from our other two native elms by the loose, drooping clusters of flowers or winged fruits, but at any time of the year by means of the irregular, corky ridges or wings which grow from every side of the branches and twigs and which give the tree a peculiarly strange shaggy appearance and mark it as distinct from all our other native trees. Because of this latter characteristic the species is not so good as an ornamental as the white elm or even the red elm.

HACKBERRY OR NETTLE-TREE



1. Winter twig, x 1.
2. Portion of twig, enlarged.
3. Leaf, x $\frac{3}{4}$.
4. Flowering branchlet, x $\frac{1}{2}$.
5. Staminate flower, enlarged.
6. Pistillate flower, enlarged.
7. Fruit, x 1.

(From Otis: Mich. Trees)

HACKBERRY OR NETTLE-TREE

Celtis occidentalis L.

The Elm Family

ULMACEAE

Habit and Habitat: A large tree, 40-50 feet high, with a trunk diameter of 1-2 feet; trunk usually straight, and symmetrical, dividing at some distance above the ground into three or four large, upright branches which produce many, slender, zigzag twigs, the whole forming a rather narrow, rounded and rather open crown. Prefers the rich, moist, well-drained soils of ravines and wooded slopes, but is also common in the silty soils of river-bottoms, but is often seen on the drier slopes and hillsides also.

Leaves and Buds: The leaves are simple, alternate, 2-4 inches long, ovate to ovate-lanceolate, often quite oblique at the base, and very frequently with a long tapering tip, thin, serrate above the middle, smooth, light green above, pale beneath, often more or less soft downy, turning light yellow in the fall; petioles short, hairy. The terminal bud is absent; lateral buds yellowish brown, ovoid, or pyramid-shaped, flattened, closely pressed against the twig.

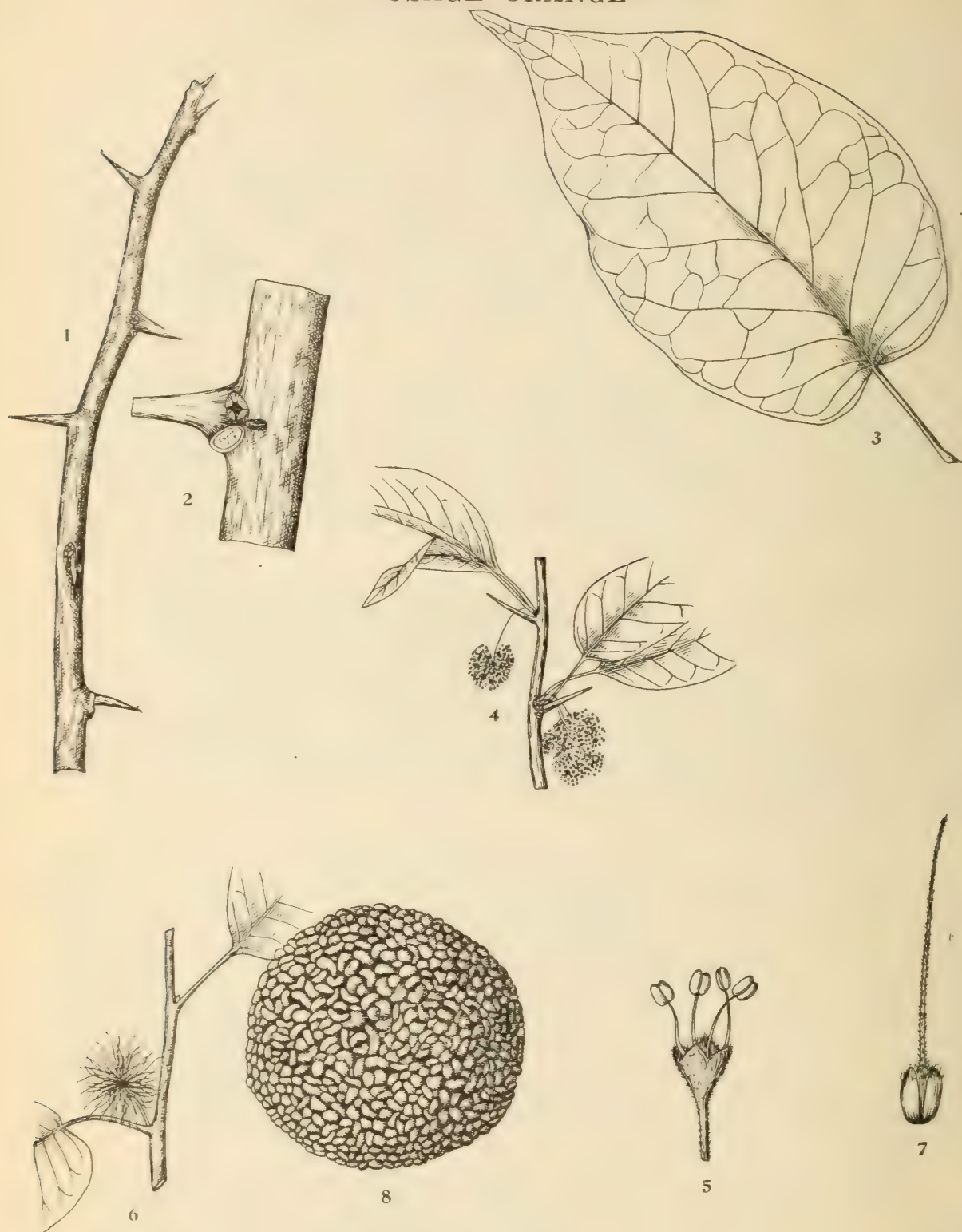
Flowers and Fruits: The flowers appear in May when the leaves are about mature, greenish, small, inconspicuous, single or in few-flowered clusters, upon short, drooping pedicels from the axils of the leaves; calyx green, 5-parted; corolla none; stamens 5; pistil 1; some of the flowers are simply staminate, some merely pistillate. The fruit is a fleshy, globular, cherry-like drupe, black or dark blue, edible, $\frac{1}{4}$ inch in diameter, borne by a slender, thread-like pedicel, maturing late in the summer, often drying out and remaining on the tree throughout the winter. These fruits are much like small cherries with thin flesh and relatively large stones.

Bark, Twigs and Wood: The bark is perhaps the most clearly distinguishing feature of the hackberry. On the older branches and main trunk the bark is thick, usually light, silvery-gray and broken into deep ridges or more or less rounded warty protuberances, and in very prominent layers, which become particularly emphasized in the older parts of the tree; the twigs are greenish and more or less hairy when young, but become smooth, shiny and brownish during the first winter. The tree frequently shows the development of dense clusters of dwarfed twigs which are very prominent during the winter. These are called "witches' brooms", and are apparently due to the attacks of certain insects. The wood is greenish-yellow, soft, heavy, coarse-grained, weak, fairly durable in contact with the soil.

Distribution in the State: Hackberry is found in practically all parts of the state where the natural conditions permit of its growth, that is, it is distributed throughout the state. Being disseminated by birds, it has been very widely scattered away from the main belts of woodland along the stream courses which constitute its natural home. Many clumps of hackberry trees occur far inland in the sandhill region and in far western and southwestern Nebraska. Map 33.

Remarks: This tree is hardy in all portions of the state and so may be grown successfully where many other native trees fail. It is fairly good as a street and lawn tree although the "witches broom" development sometimes makes the trees unsightly for such purposes.

OSAGE ORANGE



1. Winter twig, x 1.
2. Portion of twig, enlarged.
3. Leaf, x $\frac{1}{2}$.
4. Staminate flowering branchlet, x $\frac{1}{2}$.
5. Staminate flower, enlarged.
6. Pistillate flowering branchlet, x $\frac{1}{2}$.
7. Pistillate flower, enlarged.
8. Fruit, x $\frac{1}{4}$.

(From Otis: Mich. Trees)

OSAGE ORANGE
Toxylon pomiferum Raf.

The Nettle Family
MORACEAE

Habit and Habitat: A tree, growing naturally to a height of 25-30 feet, although it is often planted close and trimmed as a hedge. The trunk is usually short and soon divides into several prominent limbs with peculiarly upwardly arching branches, producing a low and symmetrical, rounded crown especially when growing in the open or alone. This tree is native to the southland where it thrives but it was introduced into Nebraska by the earlier settlers and is now seen in very nearly all parts of the state, commonly planted as a "hedge fence". It will endure a rather remarkable range of habitat conditions although the hot summers and the cold dry winters of central to western Nebraska test it very severely.

Leaves and Buds: The leaves are alternate, simple, entire or wavy on the margin, 3-6 inches long and 1-2 inches wide, thick and firm, dark green and glossy, juice more or less milky; petioles slender, more or less hairy. Terminal bud missing, lateral buds small, almost hidden in the bark.

Flowers and Fruits: Flowers produced late in June, after the leaves; staminate in dense globular clusters about $\frac{3}{4}$ inch in diameter upon slender thread-like stalks, drooping from the axils of the leaves; pistillate flowers in dense spherical heads at the end of short, stocky pedicel, erect in the axils of leaves. Fruit ripening in autumn, a pale yellowish-green, orange-like structure 2-4 inches in diameter, composed of many, united, cherry-like fruits tightly crowded and grown together. Not edible. Seeds brown.

Bark, Twigs and Wood: Young twigs bright green, more or less hairy, becoming yellowish and armed with stout, sharp-pointed thorns. The bark on the older branches and the trunk becomes deeply furrowed, more or less scaly, and dark orange-brown in color. The bark on the roots is bright orange-red and arranged in very thin layers. The wood is very hard and heavy, strong, flexible, coarse, annual rings distinct, bright yellowish red, with thin lighter-colored sap wood, very durable in contact with the soil but difficult to work.

Distribution in the State: Found in almost all parts of the state where it has been planted along the fence rows or as a hedge. More abundant in the eastern counties where it has been used extensively as a fence post timber. It does not do so well in the northern or western portions of the state, or in the sandier soils.

Remarks: This tree was extensively planted as a hedge by the early settlers of Nebraska. In late years such hedges have fallen into disrepute because the trees have been let grow without trimming and the hedge rows have "sapped" the soil to considerable distance on each side of the row, consequently many such rows have been cut for fence posts. No more durable wood can be found in the state, but when dry it is so hard that a staple can scarcely be driven into it. If the fence posts are set green and the staples driven into the green wood then the wood checks badly in drying, the staples fall out and thus the fence is loosened. Nevertheless this is one of our most valuable trees for fence posts. The tree grows quite rapidly, and rather small trunks or branches make good posts. Usually the main trunk may be split to make from 2-4 good-sized fence posts.

RED MULBERRY



1. Winter twig, x 1.
2. Portion of twig, enlarged.
3. Leaf, x 1.
4. Spike of staminate flowers, x 1.
5. Staminate flower, enlarged.
6. Spike of pistillate flowers, x 1.
7. Pistillate flower, enlarged.
8. Fruit, x 1.

(From Otis: Mich. Trees)

RED MULBERRY

Morus rubra L.

The Mulberry Family

MORACEAE

Habit and Habitat: A small tree, 15-30 feet high, with a trunk diameter of 3-10 inches, in our state, larger farther eastward, with a short trunk, and numerous stout spreading, more or less zigzag branches forming a dense, broad, round-topped crown in which there are many slender, whip-like branchlets. Prefers the moist, rich soil of woods and bottom-lands, but may be grown in our ordinary prairie soils.

Leaves and Buds: Leaves alternate, simple, 2-5 inches long, about as broad as long, variable in shape, ovate or roundish, often 3-5-lobed, coarsely serrate, acute at the tip, more or less heart-shaped at the base, yellow-green or reddish when young, becoming thin, dark blue-green and smooth or rough above, paler and more or less hairy beneath; petioles 1-2 inches long, smooth, with milky juice, bright yellow in early fall. Buds broad, ovate, blunt at the tip, $\frac{1}{4}$ inch long, light brown, shiny.

Flowers and Fruits: Flowers appearing in May at the same time as the leaves; the staminate in dense clusters, 1-2 inches long, on short hairy pedicels; the pistillate in densely-flowered clusters about 1 inch long, on short, hairy stalks; calyx 4-lobed, hairy; corolla 0; stamens 4, green; ovary stout, ribbed. Fruit ripening in July, formed by the ripening of the whole cluster of pistillate flowers, consisting of numerous cherry-like fruits, each about $\frac{1}{2}$ inch thick, closely grown together, and inclosed in the fleshy calices, bright red at first, becoming dark purple or black, juicy, sweet, "flat", edible.

Bark, Twigs and Wood: The bark on the main trunk and main branches is dark brown tinged with red, more or less furrowed, and divided into irregular plates, becoming somewhat scaly; twigs greenish, often tinged with red at first, and downy, becoming smooth, red-brown and finally brown. The wood is pale orange colored with thick, lighter colored sapwood, light, soft, weak, tough, coarse-grained, very durable in contact with the soil; used for fence posts, poles and cooperage stock.

Distribution in the State: Abundant and wide-spread in eastern and southern United States as far west as Missouri from the forests of which state it has entered Nebraska by way of the Missouri river and has extended northwestward along the eastern border of the state to Cedar county, and westward on the southern border to Jefferson and Thayer counties. The species has also been widely planted in this state. Map 34.

Remarks: The mulberry is a rapidly growing tree in moist soil, is easily transplanted and on the whole is one of our best native trees to grow for fence post material, because of the durable nature of the wood. The tree is sometimes used as an ornamental, but some people object to it for this purpose because of the muss produced by the fruits which fall for a rather long time during the ripening period. The southern Indians used to weave a coarse cloth from the tough fibers of the inner bark.

SYCAMORE. BUTTON-BALL TREE



1. Winter twig, x 1.
2. Portion of twig, side view, x 1.
3. Vertical section of twig, summer bud and leaf petiole, enlarged.
4. Leaf, x $\frac{3}{8}$.
5. Flowering branchlet, x $\frac{1}{2}$.
6. Staminate flower, enlarged.
7. Pistillate flower, enlarged.
8. Fruit, x $\frac{3}{8}$.
9. Achene, enlarged.

(From Otis: Mich. Trees)

SYCAMORE OR BUTTONBALL TREE

Platanus occidentalis L.

The Sycamore Family

PLATANACEAE

Habit and Habitat: A large tree, reaching a height of 60-80 feet in our state, with a trunk diameter of 1½ to 3 feet. Sometimes the trunk branches near the ground into several secondary trunks. The crown is usually broad and open, and often irregular and massive, with numerous, large and widely spreading branches. Prefers the deep, moist soil of river-bottoms and usually occurs as widely scattered individuals in a forest of elms, walnuts and lindens.

Leaves and Buds: The leaves are alternate, simple, 3-8 inches broad, very commonly broader than long, more or less deeply 3-5-lobed, bright green above, pale beneath, the under surface sometimes, especially when young, being covered with a scurfy or powdery substance, the margins of the lobes being coarsely toothed or scalloped; petiole stout, more or less hairy, 1-2 inches long. Terminal bud absent, lateral buds alternate, usually broadly conical and blunt, about ¼ inch long, shiny, brown. Base of the petiole fits closely over the conical bud like a cap so that the leaf scar is nearly circular.

Flowers and Fruits: The flowers appear in May at the time the leaves are about half grown or a little later, and they are borne in dense globular clusters or heads. The staminate flower heads are dark maroon or red, on short axillary stalks. The pistillate flower heads are green and borne by long slender peduncles from the tips of the twigs. The fruit is ripe in October or later and occurs in the form of long-pedunculate, yellowish-brown heads which are about 1 inch in diameter. These fruit balls persist upon the trees for several months, often through the winter and into the following summer.

Bark, Twigs and Wood: The bark on the twigs is pale green and more or less hairy when young, becoming smooth later, finally gray or almost white, thick reddish-brown and scaly on the trunk, broken into long plate-like scales higher up in the tree which peel off and thereby expose the greenish or white younger bark beneath the scales. The bark characteristics are usually so distinct as to identify this tree. The wood is light reddish-brown, heavy, tough, hard, coarse-grained, difficult to split and work, beautiful on quarter-sawed surfaces, not very durable. Used for interior trim and in the manufacture of tobacco boxes, and butcher's blocks.

Distribution in the State: Occurs naturally only in a narrow belt along the Missouri river from the southeastern corner of the state to somewhat north of Omaha. It seldom gets more than 15-25 miles west of the woodlands adjacent to the Missouri. The species is planted, however, in all parts of the state and it does well under cultivation. Map 49.

Remarks: The sycamore is one of our most beautiful and desirable ornamental native forest trees. It grows very rapidly and is a fine tree at all ages and in all seasons. Its whitish trunk and broadly spreading crown present certain features not seen in any other tree. The sycamore is not bothered by fungous diseases and other pests so badly in Nebraska as it is farther east. It should be planted more freely as an ornamental.

PAWPAW



1. Winter twig, x $1\frac{1}{2}$.
2. Leaf, x 1. (from Sargent)
3. Flowering branchlet, x $\frac{1}{2}$. (from Sargent)
4. Mature fruit, x $\frac{1}{2}$.

PAWPAW
Asimina triloba (L.) Dunal

The Pawpaw Family
ANONACEAE

Habit and Habitat: A tall shrub or low tree, sometimes reaching a height of 30-40 feet, but usually much smaller, with a straight trunk which rarely exceeds 1 foot in diameter, usually much less, the small, spreading branches and slender twigs form a more or less irregular, bushy crown, or when isolated, developing a pyramidal crown; commonly growing in thickets where it occupies the ground to the exclusion of all other woody plants, or scattered as undergrowth in the forest. Prefers deep, rich, moist, loamy soil along streams and in river bottom-lands.

Leaves and Buds: Leaves alternate, simple, obovate-lanceolate, 8-12 inches long, 4-6 inches wide, abruptly pointed at the apex, gradually and regularly narrowed to a long, wedge-shaped base, margin entire or merely wavy, as they unfold from the bud they are rusty-hairy beneath and somewhat hairy above, but at maturity they are smooth and light green above, paler beneath. Buds small, flattened, acuminate or blunt, $\frac{1}{8}$ inch long, brown, covered with rusty-brown hairs.

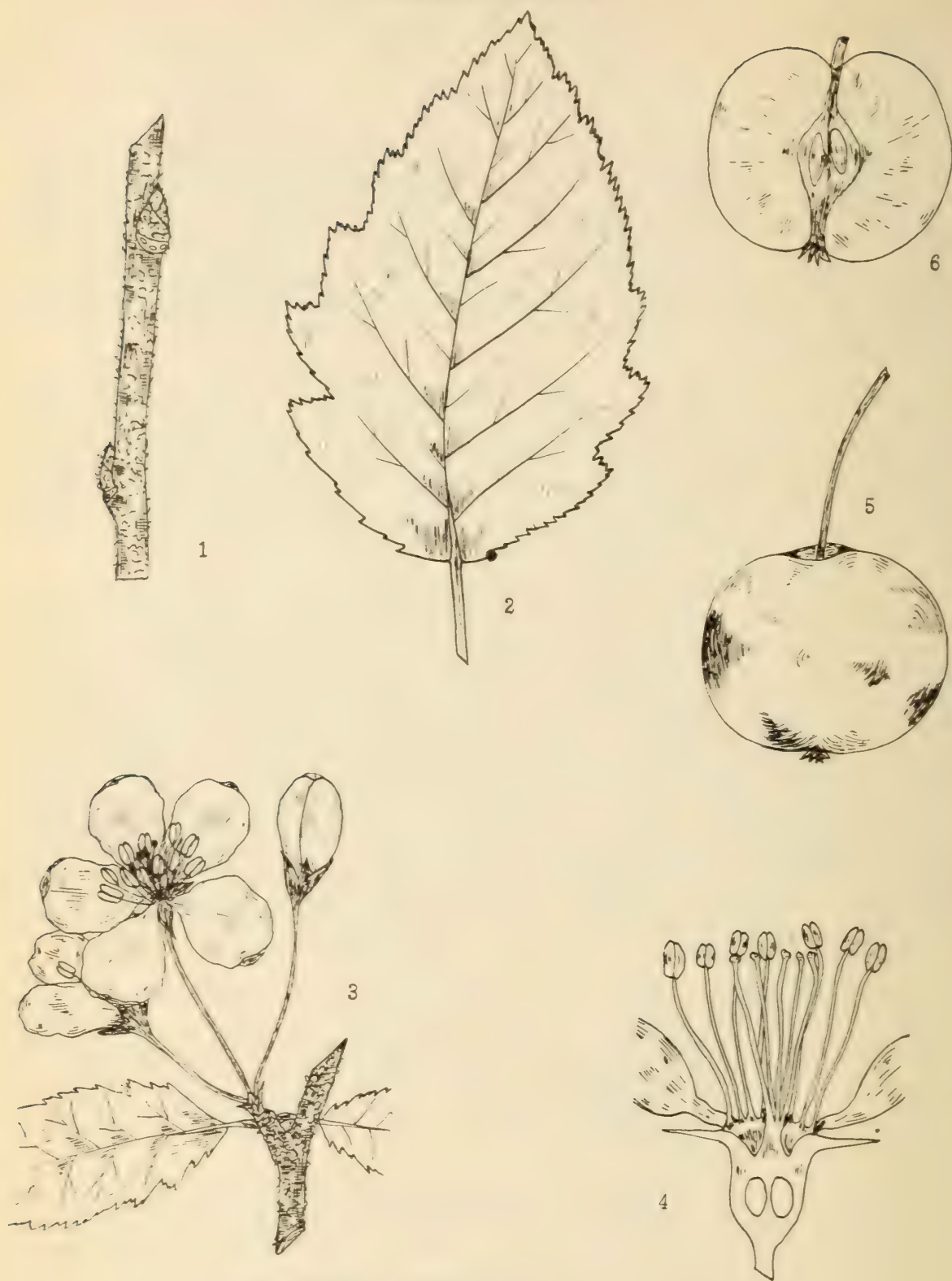
Flowers and Fruits: Flowers appearing in April with the leaves, perfect, solitary, axillary, often nearly 2 inches wide when fully open, on stout, hairy pedicels, 1-1 $\frac{1}{2}$ inches long, covered with scattered, rusty-brown hairs, sepals 3, ovate, acuminate, pale green, densely hairy on the outer surface, petals 6, in two series, green at first, becoming brown, the outer petals finally deep, reddish-purple and very conspicuously veiny, very broad, rounded or pointed at the apex, turned back from about the middle, 2-3 times as long as the sepals, stamens many, densely packed in a globular mass in the center of the flower. Fruit a large, fleshy, berry-like structure, oval to cylindrical, straight or slightly curved, blunt or pointed at the apex, 2-5 inches long, 1-1 $\frac{1}{2}$ inches in diameter, greenish-yellow or at maturity brownish or black when fully ripe in September or October, with a thin skin and a thick, translucent, sweet and luscious flesh containing several large, flat, wrinkled, brown seeds, 1 inch long and about $\frac{1}{2}$ inch wide, with rounded ends.

Bark, Twigs and Wood: Bark dark brown and marked by a large, ashen blotches and small wart-like protuberances, divided by shallow, irregular fissures into broad, net-like plates, twigs light brown, tinged with red and marked by shallow grooves which are more or less parallel or netted, inner bark tough and fibrous. Wood light, soft, weak, coarse-grained, spongy, pale greenish-yellow, with thin sapwood, of no commercial importance.

Distribution in the State: Pawpaw is common throughout southern and eastern United States south of New York and as far westward as the Missouri forests from which it has moved up the river valleys to southeastern Nebraska and into Richardson, Pawnee, Nemaha, Otoe and Saunders counties where it is frequently seen in its typical habitats. Map 35.

Remarks: The handsome foliage and beautiful large flowers of the pawpaw, together with its curious fruits have made this species more or less popular as an ornamental tree. The fruits are very fragrant, delicious and nutritious when ripe, but some people do not like them.

PRAIRIE APPLE



1. Winter twig, x 1.
 2. Leaf, x $\frac{3}{4}$.
 3. Flowering branchlet, x $\frac{3}{4}$.
 4. Vertical section of flower, enlarged.
 5. Mature fruit, x 1.
 6. Vertical section of fruit, x 1.
- (Original)

PRAIRIE APPLE
Malus iowensis (Wood) Britton

The Apple Family
POMACEAE

Habit and Habitat: A small tree, 20-30 feet high, with a trunk diameter of 8-18 inches, frequently a low, scraggly shrub; numerous, stout, spreading branches forming a broad, rounded crown, the lateral twigs often armed with numerous, coarse spines or spur-like branches. Prefers the rich, moist, well-drained soils in our eastern Nebraska woodlands, especially along the banks of streams where it may occasionally form small thickets.

Leaves and Buds: Leaves alternate, simple, ovate, oblong, acute or rounded at the apex, acute or rounded at the base, 3-4 inches long and about half as broad, sharply and deeply serrate, sometimes lobed, hoary-hairy when they unfold from the bud, becoming nearly smooth, thick and firm, dark green and shiny above, pale yellowish-green and fine-hairy beneath, turning yellow in autumn before they fall, petioles stout, more or less hairy, especially at first, 1-1½ inches long. Buds minute, obtuse, with bright red or brownish scales, more or less hairy.

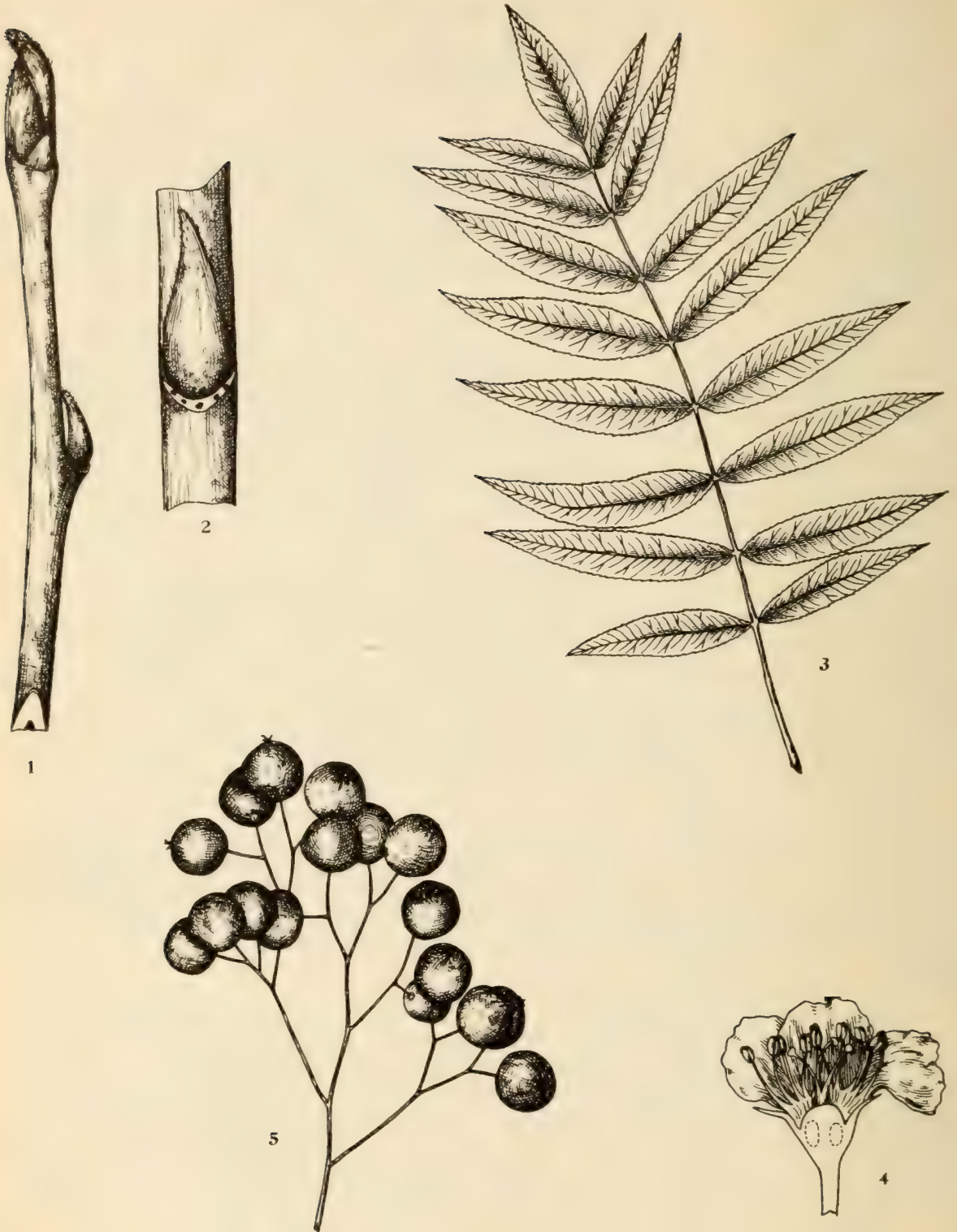
Flowers and Fruits: Flowers appearing in May when the leaves are about full grown, 1½-2 inches wide when fully expanded, on slender hairy pedicels about 1 inch long, or in few-flowered clusters; calyx urn-shaped, coated with thick snow-white hairs, sepals 5, greenish, hairy on the inner surface; petals 5, inserted on the edge of the calyx tube, white or bright pink, obovate, very fragrant; stamens many, on the calyx margin; styles 5, slender; ovary hairy. Fruit mature in October, a greenish-yellow, fragrant but bitter apple, 1-1½ inches in diameter, borne on stout, more or less hairy stalks about 1 inch long, edible when cooked.

Bark, Twigs and Wood: Twigs at first white-hairy, smooth or slightly hairy, bright reddish-brown, marked by scattered, pale spots or specks in the first winter. Bark becoming ¼-⅓ inch thick, and breaking into long, narrow, persistent, reddish-brown scales, and becoming more or less deeply fissured. The wood is heavy, soft, close-grained, weak, reddish-brown, with thick yellowish or light brown sapwood.

Distribution in the State: This western crab-apple or prairie crab, as we have called it, is widely distributed in the Mississippi valley from the Gulf of Mexico to central Minnesota, being abundant in Missouri from the forests of which it has extended its range into Nebraska along the Missouri river to the mouth of the Niobrara, thence westward to Brown county; it has also followed the Nemaha to Gage county and the Platte to Butler county. There are two or three other wild apples, closely related to the above species, which are found farther eastward.

Remarks: All of our wild American apples produce very fragrant flowers and in some of them the fruits are also quite fragrant. The trees of this, the only native Nebraska apple, are wondrously beautiful when in full bloom, and the fragrance may be carried for a considerable distance from the tree so that the tree is a rather popular one for ornamental planting in small gardens and shrubberies. The fruits are occasionally used in making preserves and jelly. The Bechtel crab is a recently introduced form of this tree which produces large, double, rose-colored flowers, and is widely cultivated as an ornamental in the east and south.

MOUNTAIN ASH



1. Winter twig, x 1.
2. Portion of twig, enlarged.
3. Leaf, x $\frac{1}{3}$.
4. Vertical section of flower, enlarged.
5. Portion of a fruit cluster, x 1.

(From Otis: Mich. Trees)

MOUNTAIN ASH

Sorbus americana Marsh.

The Apple Family

POMACEAE

Habit and Habitat: A small tree, 15-20 feet tall, or in the south usually a shrub, with a trunk diameter of 3-8 inches; branches slender, spreading, erect or pendulous, forming a narrow, open, rounded crown. Prefers a rich, moist, cool soil along river banks or about swamps, but also grows well in the rocky or gravelly soils of mountains.

Leaves and Buds: Leaves alternate, pinnately compound, 6-8 inches long, leaflets 7-17, 2-3 inches long, $\frac{1}{2}$ - $\frac{3}{4}$ inch wide, sessile or nearly so except the terminal one which has a slender stalk, lanceolate or oblong-lanceolate, taper-pointed, unequally wedge-shaped or rounded at the base, finely and sharply serrate above the base, smooth, dark yellow-green above, paler beneath, yellow in autumn; petioles dark green or red. Buds ovoid, dark red, acute, $\frac{1}{4}$ - $\frac{3}{4}$ inch long, tip curved, lateral buds smaller, appressed, scales rounded, more or less hairy, inner scales very hairy as the bud enlarges.

Flowers and Fruits: Flowers produced in May or June, after the leaves, perfect, $\frac{1}{8}$ inch broad, borne in many-flowered, flat, compound clusters 3-5 inches wide; calyx urn-shaped, 5-lobed, hairy; petals 5, white; stamens many, attached on the rim of the calyx; ovary imbedded in the fleshy calyx; styles 2-3. Fruit a globular, berry-like apple or pome, $\frac{1}{4}$ inch in diameter, bright red, borne in many-fruited clusters which are often pendulous on the twigs, and may remain on the tree through the winter; flesh thin and sour; seeds light brown.

Bark, Twigs and Wood: Twigs reddish-brown and hairy at first, becoming smooth and dark brown; bark thin, light gray-brown or greenish-brown on the trunk and main branches, smooth or somewhat roughened on old trees, papery outer layers sometimes separating. The wood is pale brown, light, soft, close-grained, weak, sapwood thick, lighter colored, of little commercial value.

Distribution in the State: The mountain ash does not occur naturally in the state but it has been planted quite frequently as an ornamental. The tree is found from Newfoundland to North Carolina and Michigan but reaches its largest size on the northern shores of Lake Superior and Lake Huron in more or less swampy lands.

Remarks: The mountain ash is one of our most beautiful American trees; it is easily transplanted but grows slowly. It does not appear to thrive upon the relatively dry soils and in the dry hot climate of Nebraska but I have seen some good specimens in the state. A more commonly planted mountain ash is the European species, *Sorbus aucuparia* L., which closely resembles the American tree. Either tree is desirable as a lawn or park tree because of the beautiful foliage, the large clusters of white flowers in early summer and the brilliant clusters of fruits which are especially conspicuous in the autumn after the leaves have fallen and during the winter. The mountain ash should be more generally planted as an ornamental in eastern Nebraska, but it should be placed only in the cooler, moister sites and where it may be watered during periods of hot, dry weather.

JUNEBERRY TREE



1. Winter twig, x 1.
2. Portion of twig, enlarged.
3. Leaf, x 1.
4. Flowering branchlet, x $\frac{1}{2}$.
5. Vertical section of flower, enlarged.
6. Fruiting branchlet, x $\frac{1}{2}$.

(From Otis: Mich. Trees)

JUNEBERRY TREE

Amelanchier canadensis (L.) Medic.

The Apple Family

POMACEAE

Habit and Habitat: A tree, 20-30 feet high, with a smooth trunk, 3-10 inches in diameter; the few main branches and small, slender, twigs form a narrow, rounded and open crown, which is often quite narrow in our western form of the tree; found only in the rich, loamy, well-drained soils of wood-lands and wooded slopes along stream courses.

Leaves and Buds: The leaves are alternate, simple, 2-3 inches long and about 1-1½ inches broad, oval to ovate, sharply and finely serrate, abruptly pointed, smooth and dark green above, paler beneath; petioles slender, ½-1 inch long. Winter-buds yellowish or brown, narrowly-conical, sharp-pointed; scales very conspicuous, ¼-½ inch long, slightly hairy.

Flowers and Fruits: The flowers are usually out in April or early May, before the leaves are full grown, perfect, large, white, borne in drooping, loosely-flowered clusters, 3-5 inches long; calyx 5-lobed, bell-shaped, hairy inside; petals 5, strap-like, white, 1 inch or less in length; stamens many; styles 5, united toward the base. Fruit ripe in mid-summer, a small, berry-like apple, ¼-½ inch long, green at first, turning bright red and finally dark purple, sweet and edible when ripe, fruit eagerly sought by the birds.

Bark, Twigs and Wood: The bark on the twigs is light green and very smooth, later it turns to reddish-brown, thin, pale reddish-brown or grayish on the larger branches and main trunk, smooth or sometimes divided into narrow elongated scaly ridges by shallow fissures, often quite smooth and gray. The wood is very hard, heavy, strong, close-grained, dark brown or reddish-brown, with thick light-colored sapwood, resembling apple wood, in fact the tree has many aspects of an apple tree.

Distribution in the State: The species occurs in the Missouri forests, from which it has moved up the valley of the Missouri river as far as Sarpy county, but has not developed abundantly in any part of its narrow range in this state. The tree is always found in the woods with other trees. It does not thrive, apparently, far from the borders of our woodlands although it is quite commonly seen in dry soil farther east. Map 40.

Remarks: This is the "sarvice-berry" or shad-bush of eastern United States about which poets and naturalists of every grade or description have written. The tree is so rare and localized in our state that very few of our citizens know it although the snowy white flowers are very conspicuous in early spring at a time when the woods are still rather bare of foliage. It is another prominent eastern tree which reaches its western limit in southeastern Nebraska. Another form of the tree, possibly a different species, is found in northeastern Nebraska and along the Niobrara river, but the identity of that plant is still somewhat in doubt.

WILD PLUM



1. Winter twig, x 2.
 2. Leaf, x $\frac{1}{2}$.
 3. Flowering branchlet, x $\frac{1}{2}$.
 4. Section of flower, enlarged.
 5. Cluster of fruits, x $\frac{1}{2}$.
 6. Vertical section of fruit, x 1.
- (Original)

WILD PLUM

Prunus americana Marsh.

The Plum Family

DRUPACEAE

Habit and Habitat: A small tree, 20-35 feet in height, with a trunk rarely attaining a diameter of 1 foot, commonly much smaller, often shrubby and bushy; usually divided 4-5 feet from the ground into many spreading branches which form a broad, open crown, often more or less irregular and thorny. Prefers the rich, moist soil on the banks of streams or about ponds and lakes, frequently forming thickets of considerable extent in such sites.

Leaves and Buds: Leaves simple, alternate, oval or sometimes obovate, acuminate, narrowed and often rounded at the base, sharply and often doubly serrate, thick and firm, dark green above, pale and smooth, or more or less hairy beneath, 3-4 inches long, about $1\frac{1}{2}$ inches wide; petioles slender, $\frac{1}{2}$ - $\frac{2}{3}$ inch long. Winter-buds acute, $\frac{1}{8}$ - $\frac{1}{4}$ inch long, chestnut-brown; inner scales becoming leaf-like as the buds unfold.

Flowers and Fruits: Flowers appearing in early spring with the leaves, or before the leaves, about 1 inch in diameter, fragrant, on slender, smooth, or hairy, green pedicels $\frac{1}{3}$ - $\frac{2}{3}$ inch long, in 2-5-flowered clusters; calyx 5-lobed, light red, smooth, green inside, lobes acute; petals 5, white, rounded or slightly cut at the apex; stamens 15-20; ovary club-shaped, greenish. Fruit a globose plum, usually less than 1 inch in diameter, green, or as it ripens turning to orange, red and bright red when ripe; skin thick, tough, acrid; flesh bright yellow, acid, sweet, juicy, edible; stone oval, pointed at the apex, often as thick as broad, sometimes distinctly flattened, ridged or grooved on the edge.

Bark, Twigs and Wood: Branchlets are light green at first, smooth or more or less densely hairy, light orange-brown during the first winter, becoming darker and tinged with red or purple; the trees often develop many slender, and more or less spiny, lateral branchlets. The bark on the main trunk is about $\frac{1}{2}$ inch thick, dark brown, tinged with red, separating at the surface into large, thin, scaly, persistent plates. Wood hard, heavy, close-grained, strong, dark brown tinged with red, with thin lighter colored sapwood.

Distribution in the State: The wild plum is common in the country east of the Great Plains, into and across which it has been carried. It is found in nearly all portions of Nebraska even in the heart of the sandhill region where it has been carried by the birds and where it is often seen in the form of dense thickets in enclosed "pockets" far away from any stream or any other area of plum thicket. Map 38.

Remarks: This is the wild plum, the fruits of which have been eagerly sought upon plumming expeditions innumerable. The fruit may be made into plum butter, preserves or jelly. The Indians of the state formerly utilized this wild fruit to supplement their natural food supply which was rather meagre in the proportion of fruits. There are a number of destructive fungus diseases which have damaged these trees greatly during the past few years and have materially reduced the yield of fruit, but still one may collect many bushels of the delicious fruits in many parts of the state nearly every summer.

WILD BLACK CHERRY



1. Winter twig, x 1.
2. Portion of twig, enlarged.
3. Leaf, x $\frac{3}{4}$.
4. Margin of leaf, enlarged.
5. Flowering branchlet, x $\frac{1}{2}$.
6. Vertical section of flower, enlarged.
7. Fruiting branchlet, x $\frac{1}{2}$.

(From Otis Mich. Trees)

WILD BLACK CHERRY

Prunus serotina Ehrh.

The Plum Family

DRUPACEAE

Habit and Habitat: A good sized tree, 30-50 feet high, with a trunk diameter of 6-20 inches; main branches few, bulky, irregular, forming an open, rounded or oblong crown; trunk often branchless for 10-20 feet above the ground. In woods or open places where the soil is moist and rich, but farther east is also found in gravelly and sandy soils.

Leaves and Buds: The leaves are alternate, $1\frac{1}{2}$ -4 inches long and about one-half as broad, oval or oblong, or somewhat slenderer, margin finely serrate, with the individual teeth incurved, more or less leathery, dark green and shiny above, paler beneath, smooth on both sides, petioles short, slender, usually with 2 red glands near the blade. The terminal bud is $\frac{1}{8}$ - $\frac{1}{4}$ inch long, broadly ovoid and blunt or acutely pointed, light to dark brown, scales having a short-pointed tip and a keel on the back, lateral buds smaller.

Flowers and Fruits: Flowers usually produced in June when the leaves are about half grown, perfect, $\frac{1}{4}$ inch wide, borne in many-flowered, loose, drooping or erect clusters, 2-4 inches long; calyx cup-shaped, 5-lobed; petals 5, white, attached to the margin of the calyx cup; stamens many, also on the edge of the calyx cup; ovary thick and club-shaped. Fruit maturing in late summer or early fall, globular, $\frac{1}{3}$ - $\frac{1}{2}$ inch thick, dark purple or black, sweet, but slightly bitter, edible, with a small stone and comparatively thin flesh.

Bark, Twigs and Wood: The bark on young twigs and branches is red or reddish-brown, smooth, shiny, becoming dark brown or blackish on the old branches and main trunk, rough and broken into thick irregular plates or scales, bitter, aromatic. Wood light, strong, hard, close-grained, light reddish-brown, sapwood thin and yellow. A valuable commercial wood for cabinet making, very high priced and relatively scarce.

Distribution in the State: This is a famous forest tree of eastern United States from Vermont to Ontario, Florida, Texas and Dakota. It extends into southeastern and southern Nebraska from the Missouri forests from which so many of our native trees have come. Wild black cherry has spread along the Missouri river and its tributaries to Sarpy county and westward along the Republican valley to Franklin county. The fruits are eagerly sought by the birds and so the species is probably extending its range in our state rather rapidly. Map 39.

Remarks: There are probably not many fine specimens of wild black cherry to be found growing naturally in Nebraska, but I have seen a few. A number of fine specimens of the tree, some of them being 35 ft. high with a trunk diameter of 18 inches may be seen in the woods along Weeping Water creek in Cass county a few miles east of the town of Weeping Water. I have seen the tree west of Wabash also along the same stream and those trees probably represent the westernmost extension of the species except along the Republican valley. The species is sometimes planted as an ornamental. The bark is the source of a drug which is often used in cough medicines

CHOKE CHERRY



1. Winter twig, x 1.
2. Portion of twig, enlarged.
3. Leaf, x 1.
4. Margin of leaf, enlarged.
5. Flowering branchlet, x $\frac{1}{2}$.
6. Vertical section of flower, enlarged.
7. Fruit, x $\frac{1}{2}$.

(From Otis: Mich. Trees)

CHOKER CHERRY
Prunus virginiana L.

The Plum Family
DRUPACEAE

Habit and Habitat: A large shrub or often a small tree, 15-25 feet high, with a trunk diameter of 3-6 inches, and the few crooked branches and twigs forming a spreading or rounded crown, seldom a beautiful tree; prefers the moist, rich loam of woodlands and river-banks, but is also common in drier sites and in sandy and rocky soils where it sometimes forms dense patches.

Leaves and Buds: The leaves are alternate, simple, 2-4 inches long, 1½-2 inches broad, oblong or oval, abruptly pointed at the tip, finely and sharply serrate, the teeth pointing forward, not turned in, dull, dark green above, paler beneath, smooth on both sides; petioles short, slender, glandular. Terminal bud ¼-½ inch long, conical, pointed; scales rounded at the tip, light brown, smooth. Lateral buds the same, or somewhat smaller and divergent in early spring

Flowers and Fruits: Flowers out in May or early June when the leaves are about half grown, perfect, ½ inch wide, borne on short slender pedicels in several-flowered clusters, 2-4 inches long, spreading or drooping; calyx cup-shaped, 5-lobed; petals 5, white, borne on the rim of the calyx cup; stamens many, also on the calyx cup; ovary blunt, club-shaped. Fruit maturing after mid-summer, a spherical, dark red, yellow or black cherry, very astringent, but edible; stone globular.

Bark, Twigs and Wood: Twigs greenish or brown at first, becoming reddish-brown or dark brown, thin, shiny, dark brown or almost black on the main trunk, fissured and sometimes more or less scaly. The wood is heavy, hard, close-grained, weak, light to dark brown, with thick, lighter colored sapwood, seldom used except for fuel.

Distribution in the State: This tree is found in nearly all portions of eastern United States and is reported as far west as Texas and Colorado. It is abundant in the Missouri woods from which it has entered the state and followed the Missouri river and its tributaries from the southeastern corner northward and westward as far as Sarpy county and Lancaster county, and has also migrated up the Republican valley to Franklin county. This species is considerably more common than the wild black cherry although the two are found in about the same areas of the state. Map 36.

Remarks: The choke cherry is not as desirable a tree as the wild black cherry because it is not so large and the fruits are not so good. The Nebraska Indians used the fruits of the choke cherry as an article of diet and many of the earlier white settlers in the state were also glad to have these fruits in a land which was very poor in native wild fruits. *Prunus melanocarpa* is a closely related species which is found in many parts of the state, sometimes becoming a small tree, and which may be easily confused with this species. Botanists have juggled the scientific names of our native cherries and plums considerably in the past few years, but I am using the old nomenclature here.

HAWTHORN



1. Winter twig, x 1.
2. Leaf, x 1.
3. Flowering branchlet, x $\frac{1}{2}$.
4. Vertical section of flower, enlarged.
5. Fruit, x 1.

(From Otis: Mich. Trees)

HAWTHORN

Crataegus, several species.

The Apple Family

POMACEAE

The genus *Crataegus* is a very large group containing upwards of 150 species (possibly more) of shrubs and trees widely scattered over the United States, and called by such common names as hawthorn, red haw, thorns, thorn-apples, scarlet haw, downy thorn, white thorn, yellow haw, cock-spur thorn, etc. The group is a complex one, and very puzzling to the beginner because of the great variation of forms, the uncertainty of the nomenclature, and the general unsatisfactory condition of our knowledge of the group. The student who becomes particularly interested in haws must gain access to the more complete botanical manuals and other literature dealing with the group.

The hawthorns are usually low, wide-spreading, bushy shrubs or small, round-topped or bushy trees, seldom reaching a height exceeding 30-35 feet, and a trunk diameter of 18 inches, usually much smaller than these dimensions would indicate. The branches are strong, tough, often tortuous and more or less zigzag and armed with stiff, sharp-pointed thorns. The bark is usually more or less scaly or shredded and varies from dark red to brown and gray and is commonly shallowly fissured.

The winter-buds are small, globose or nearly so, and covered by numerous, over-lapping scales which are commonly bright chestnut-brown in color and shining.

The leaves are alternate, simple, generally serrate, often lobed, sometimes deeply lobed, with short or long petioles, and with many variations in shape, smooth and shining or more or less dull and hairy, more or less leathery and tough or thin and membranous, deciduous.

The flowers are white and they appear in May or June, with or after the leaves and are often produced in great profusion, in simple or compound, few- to many-flowered clusters on short lateral, leafy twigs; calyx tubular or bell-shaped, 5-lobed, the lobes acute or acuminate, green or reddish; petals 5, white or faintly pink; stamens many, on the edge of the calyx cup, with a rather definite arrangement and color for the different species, varying in color from pale yellow to nearly white, pink, light or dark rose-color or purple.

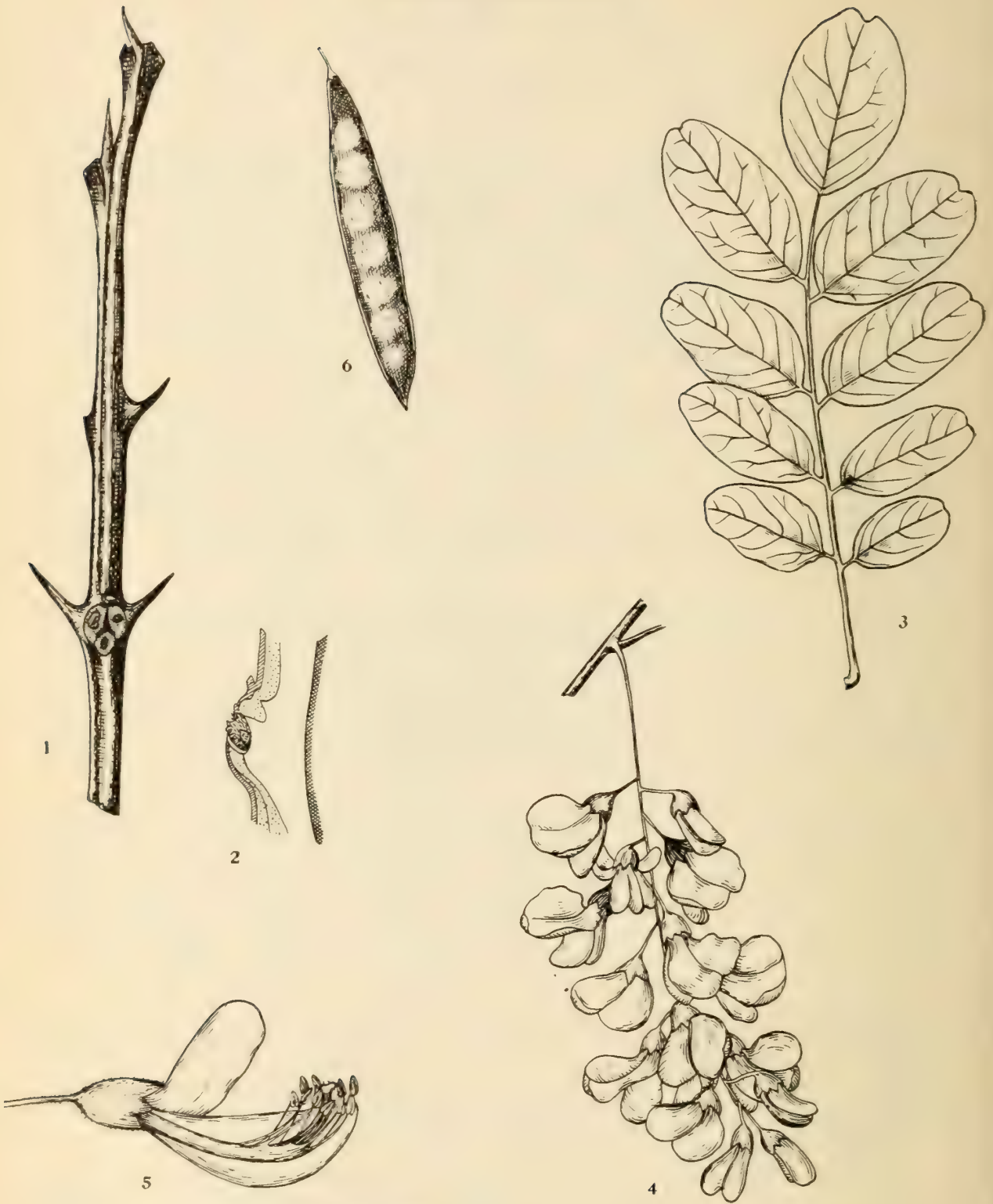
The fruit is globular, ovate, short-oblong or pear-shaped, scarlet, orange-color, red, yellow, blue, or black, resembling in all cases small to tiny apples, flesh usually dry and mealy, frequently sweet and edible.

The wood of the larger haws is heavy, hard, tough, close-grained, reddish-brown, with thick, usually pale sapwood; used for tool handles, mallets, walking sticks, other small articles and fuel.

Several of the species are valuable for hedges and other ornamental purposes. The beautiful and abundant flowers and brilliantly colored fruits make certain species quite desirable for planting in lawns and parks and several such forms are used in those places.

The hawthorns that have been reported for Nebraska are as follows: *Crataegus tomentosa* L., *C. mollis* (T. & G.) Scheele, *C. colorado* Ashe, *C. occidentalis* Britton and *C. chrysocarpa* Ashe, found in various portions of the state, especially along the Missouri river and the lower courses of its tributaries. We ought to have many specimens of our Nebraska haws to enable us to determine exactly the status of the group in this state. Map 37.

BLACK LOCUST



1. Winter twig, x 1.
2. Vertical section through lateral bud, enlarged.
3. Leaf, x $\frac{1}{2}$.
4. Cluster of flowers, x $\frac{1}{2}$.
5. Flower, with part of corolla removed, enlarged.
6. Fruit, x $\frac{1}{2}$.

(From Otis: Mich. Trees)

BLACK LOCUST
Robinia pseudacacia L.

The Pea Family
PAPILIONACEAE

Habit and Habitat: A small to large tree, in our state reaching a height of 40 feet, with a trunk diameter of 12-20 inches; the few large branches and twigs form an oval or rounded, more or less irregular and scraggly crown; the branches are often bent and twisted into various shapes. Grows best in moist, well-drained soils but readily adapts itself to a variety of site conditions.

Leaves and Buds: The leaves are alternate, pinnately compound, 6-12 inches long; leaflets 7-15 or more, 1-1½ inches long, about one-half as broad, oval or oblong, entire, or notched at the tip, short-stalked, quite thin, dull bluish-green above, pale beneath, smooth on both sides; petioles more or less hairy. Buds very tiny, 3-4 superposed, partially sunken within the twig, brownish and hairy.

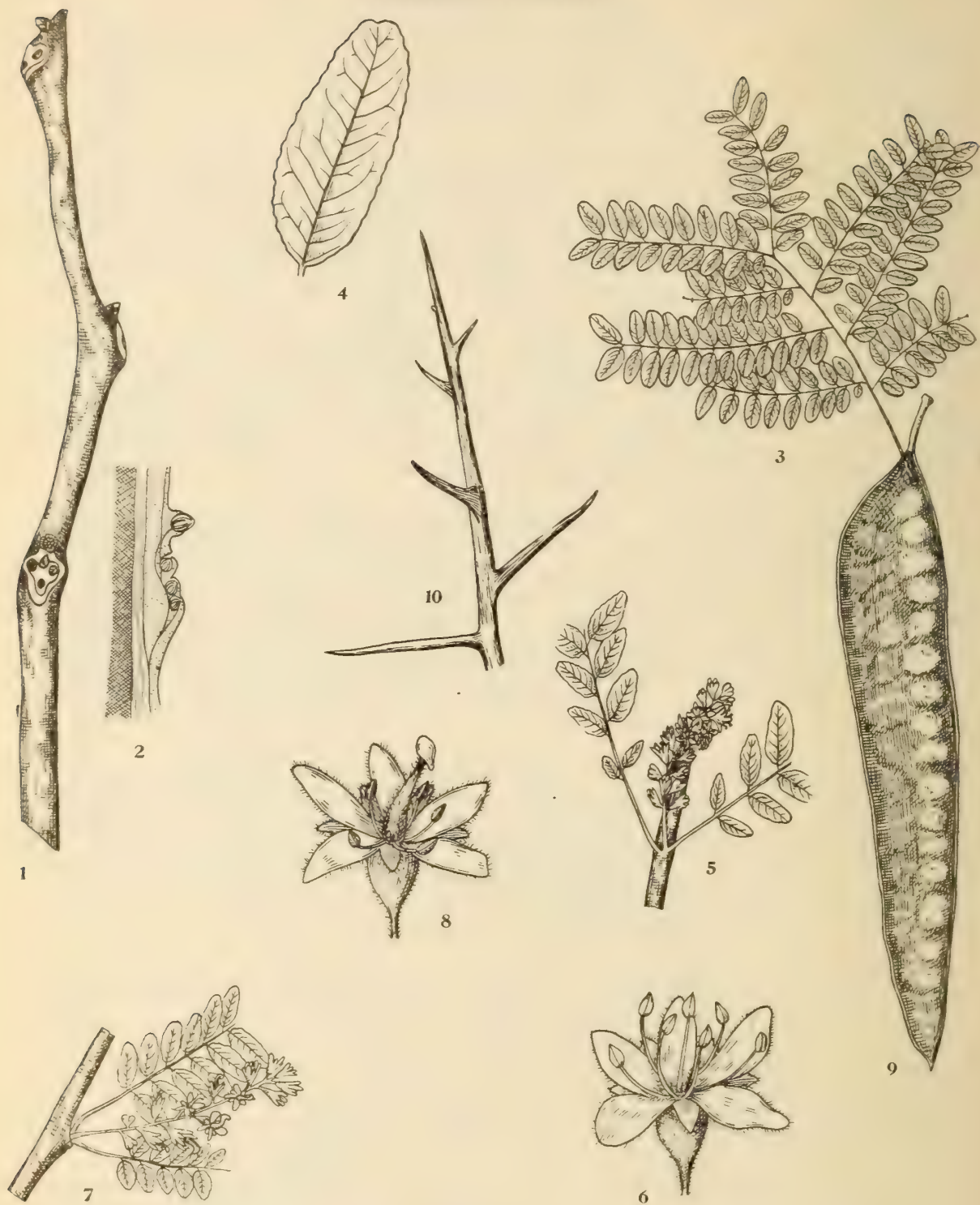
Flowers and Fruits: Flowers produced in late May or June, when leaves are full grown, perfect, in large closely-flowered, drooping, showy clusters, white or cream-colored, very fragrant, the clusters 4-6 inches long, each flower ½-1 inch long; calyx short, bell-shaped, 5-lobed, hairy; corolla pea-shaped, white; petals 5; stamens 10; pistil 1. The fruit matures in late autumn, and may persist upon the tree for many weeks after leaf-fall, a smooth, flat, linear, dark brown, dry pod, 3-4 inches long and about ½ inch wide; seeds 4-8, small, olivaceous or brown, flat, very hard.

Bark, Twigs and Wood: The twigs are smooth, green, but later become brownish and armed with low prickles or thorns with broad bases; bark on old branches and main trunk dark, reddish-brown, to nearly black, thick, deeply furrowed by heavy, curving ridges. The thorns disappear completely from the branches several years old. The wood is heavy, very strong and durable in contact with the soil, hard, close-grained, brown, with thin, pale yellow sapwood.

Distribution in the State: The black locust is native to the Pennsylvania region but has been extensively naturalized in the eastern states and the middle west. A close relative in western United States produces beautiful clusters of pink flowers. The species has been rather commonly planted in eastern Nebraska where it has escaped from cultivation and it may now be seen here and there among our native trees. It does not do well in western Nebraska although it has been planted there occasionally.

Remarks: The wood of this tree is remarkably durable in contact with the soil and hence is very valuable in the form of fence posts, poles and railway ties. A certain railroad company in the east has planted several hundred acres of the trees for ties. The tree grows rapidly for the first few years, but is short-lived. Unfortunately it becomes seriously infested with borers which cause unsightly conditions to develop, which also destroy the wood and eventually kill the tree. Numerous pests also attack the leaves in some parts of the country. The tree is easily propagated, in fact it spreads rapidly of its own accord by means of numerous underground stems. The specific name, *pseudacacia*, means "false acacia". *Robinia* is closely related to the *Acacias*.

HONEY LOCUST



1. Winter twig, x 1.
 2. Vertical section through lateral buds, enlarged.
 3. Leaf, x $\frac{1}{4}$.
 4. Leaflet, x 1.
 5. Staminate flowering branchlet, x $\frac{1}{2}$.
 6. Staminate flower, enlarged.
 7. Pistillate flowering branchlet, x $\frac{1}{2}$.
 8. Pistillate flower, enlarged.
 9. Fruit, x $\frac{1}{3}$.
 10. Spine from trunk, x $\frac{1}{2}$.
- (From Otis: Mich. Trees)

HONEY LOCUST
Gleditsia triacanthos L.

The Senna Family
CAESALPINIACEAE

Habit and Habitat: A tree, 30-50 feet tall, with a trunk diameter of 15-24 inches, dividing at a height of 6-15 feet above the ground into several large, upright branches which divide many times into long, slender, ascending and horizontal branchlets and zigzag twigs to form a widely spreading, roundish crown; trunk and main branches armed with stout, rigid, maroon, simple or branched spines, 1-8 inches long. Prefers deep rich soils but grows well in a wide variety of soil and climatic conditions, from the deep rich woodlands along the Missouri river to the dry upland soils of central Nebraska.

Leaves and Buds: The leaves are alternate, once or twice pinnately compound, 6-10 inches long; leaflets 16-18 or even more, $\frac{3}{4}$ -1 $\frac{1}{2}$ inches long, $\frac{1}{4}$ - $\frac{1}{2}$ inch broad, oblong, slightly and distinctly toothed, thin, shiny, dark green above, pale and dull beneath; petioles and midribs more or less hairy. The buds are very tiny, three or more superposed, smooth and brown, often almost covered by the bark.

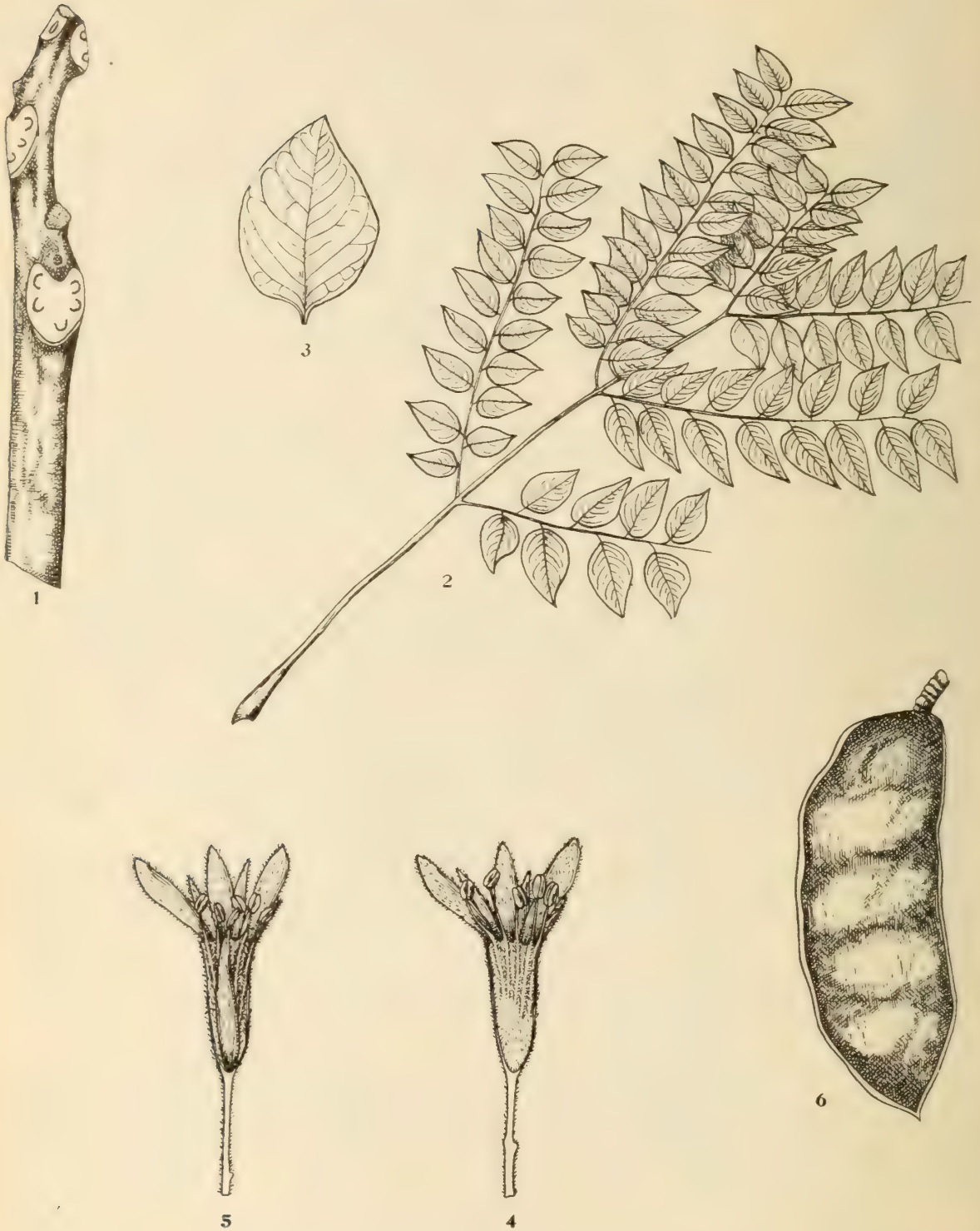
Flowers and Fruits: Flowers produced late in May or in June, after the leaves are out, inconspicuous, greenish, imperfect; staminate in short, many-flowered clusters; pistillate in slender, few-flowered clusters, on shoots of the previous year; calyx bell-shaped, hairy, 3-5-lobed; petals 3-5, greenish; stamens 3-10; ovary 1-celled, hairy. The fruits which ripen in late summer, are pendulous, flat, more or less spirally twisted, dark reddish-brown pods, 6-12 inches long and about 1 inch wide, short-stalked, sometimes in groups of two or more, often single; seeds 6-12, oval, flattish, olive colored, exceedingly hard. The ripe pods usually fall in late autumn or during the winter.

Bark, Twigs and Wood: The bark on the twigs is thin, smooth and shiny, reddish or grayish-brown, becoming thick and very dark reddish-brown or blackish on the main trunk, and fissured by the formation of long, narrow, low, scaly ridges, often quite smooth even on old trees. The twigs are usually strikingly zigzag. Wood very heavy, hard, strong, coarse-grained, red-brown, sapwood pale yellowish or greenish, durable in contact with the soil.

Distribution in the State: The honey locust is common in the forests of the Missouri river and its tributaries in southeastern Nebraska from whence it has moved up that river to the Niobrara and along that river to Cherry county. It is also found in the Republican river valley as far west as Harlan county. Map 41.

Remarks: This tree grows rapidly, is a long-lived tree and is remarkably free from damaging pests. It is easily transplanted and quite readily adapts itself to a wide variation in environmental conditions. Occasionally one finds a specimen which is quite free from the long stiff thorns and such trees are excellent for street or lawn planting. Honey locust is one of the hardiest of eastern trees which has reached Nebraska from the forests of New York, Michigan and Indiana. It is one of the most successful trees for planting in central and western Nebraska and in fact in almost all parts of the relatively arid Great Plains. The value of the wood as posts and poles should stimulate a wider utilization of this valuable species.

KENTUCKY COFFEE TREE



1. Winter twig, x 1.
2. Leaf, x $\frac{1}{4}$.
3. Leaflet, x $\frac{1}{2}$.
4. Vertical section of staminate flower, enlarged.
5. Vertical section of pistillate flower, enlarged.
6. Fruit, x $\frac{1}{4}$.

(From Otis: Mich. Trees)

KENTUCKY COFFEE-TREE
Gymnocladus dioica (L.) Koch

The Senna Family
CAESALPINIACEAE

Habit and Habitat: A rather slender tree, 30-40 feet high, with a trunk diameter of 6-20 inches; with a tall, straight trunk and small crown or the trunk dividing near the ground into several main branches which spread out to form the rounded or pyramidal, very open crown; branches stout; twigs stout, clumsy or club-like, blunt. Prefers the moist rich, well-drained loam or silt soils of north slopes and river bottom-lands.

Leaves and Buds: Leaves alternate, doubly pinnately compound, 1-4 feet long, leaflets 20-40 or more, 1-2 inches long and about half as wide, short stalked, ovate, pointed, entire, thin and membranous, dark green above, pale yellowish-green beneath, smooth, petioles stout, cylindrical, broad at the base, smooth and often more or less bluish. The buds are very small, in depressions in the bark, usually two for each leaf, brownish, silky-hairy.

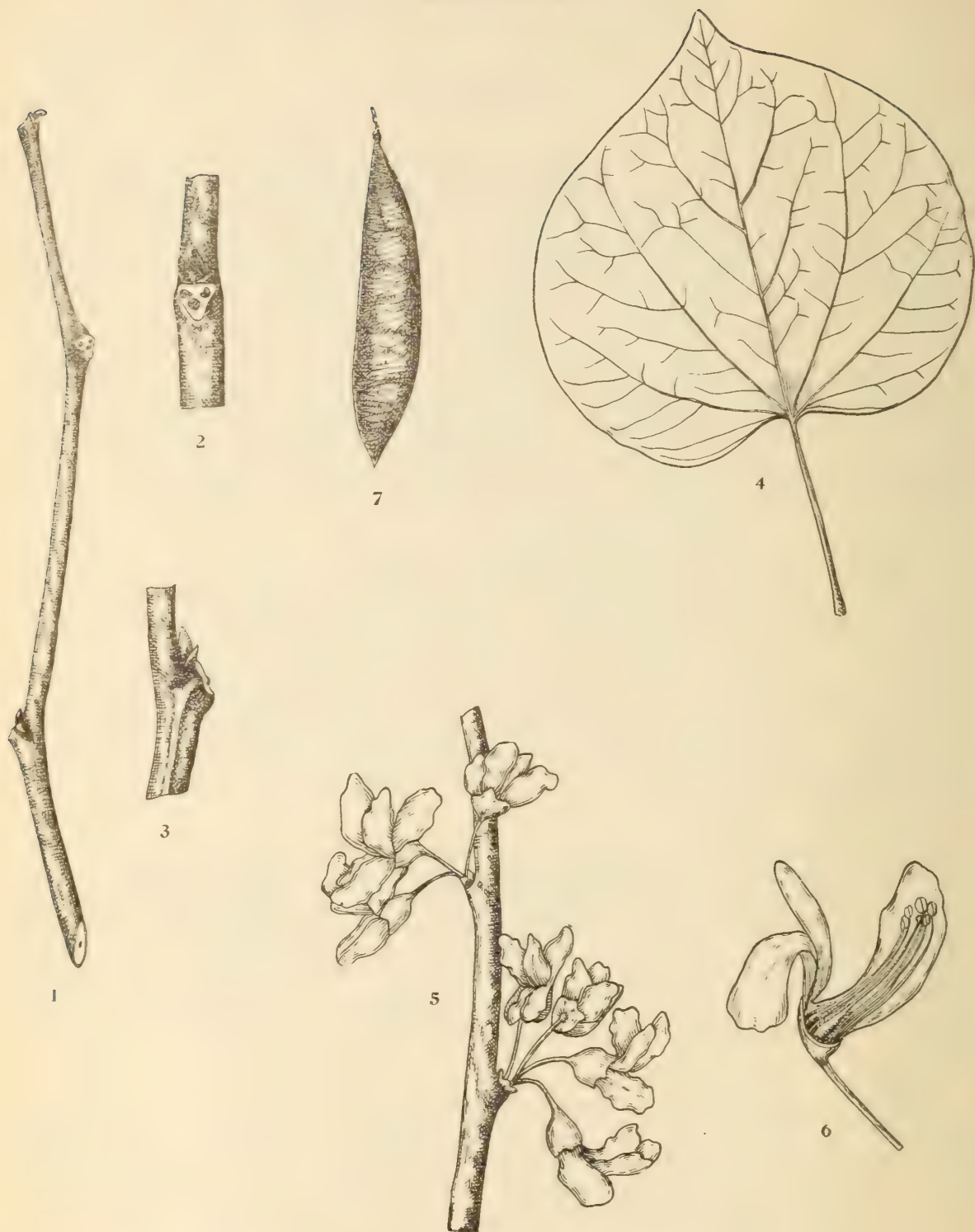
Flowers and Fruits: The flowers appear in June, when the leaves are full grown, greenish white, imperfect; the staminate in short-stalked loosely-flowered clusters 2-5 inches long; pistillate in loose, long-stalked clusters, 8-12 inches long; calyx tubular, hairy; petals 5, greenish-white; stamens 10; ovary 1-celled, hairy, irregular in shape. The fruit is a flattish, heavy, short-stalked, bright reddish brown, leathery pod, 3-8 inches long, 1-2 inches wide and $\frac{1}{4}$ - $\frac{1}{2}$ inch thick, with abruptly tapering point, containing 1-8 large flattish, olive-colored, very hard seeds imbedded in a greenish, sweetish pulp, remaining closed and on the tree until late fall or winter.

Bark, Twigs and Wood: The bark of very young twigs is greenish, often bluish or purplish, often coated with short, densely aggregated reddish hairs, becoming light brown and smooth, on old branches and main trunk, thick and deeply fissured and scaly, the scales often very hard and resistant and attached by one side, dark reddish-gray, quite red beneath the bark scales. The wood is heavy, hard, strong, coarse-grained, very durable in contact with the soil, bright, reddish-brown, with thin light-colored sapwood, taking a fine polish in finishing.

Distribution in the State: This is another eastern tree which is common in the Iowa and Missouri forests and from those states has moved into Nebraska along the Missouri river across the whole eastern border and up the Niobrara river to the region of Rock county. The species does not occur quite so far west along the southern border of the state as does its near relative the honey locust. Map 42.

Remarks: The generic name of this tree comes from two Greek words meaning "naked branch" or "naked club", from the stout, naked and clumsy branches of which the open crown of the tree is composed. This tree is really quite a novelty among our few native trees because of its enormous compound leaves and its odd, leathery pods which are especially noticeable after the leaves have fallen. A beautiful specimen of the species is growing upon the university campus at Lincoln which clearly indicates the value of the species as a landscape element.

RED BUD



1. Winter twig, x 1.
2. Portion of twig, front view, enlarged.
3. Portion of twig, side view, enlarged.
4. Leaf, x $\frac{1}{2}$.
5. Flowering branchlet, x 1.
6. Vertical section of flower, enlarged.
7. Fruit, x $\frac{1}{2}$.

(From Otis: Mich. Trees)

RED-BUD OR JUDAS-TREE

Cercis canadensis L.

The Senna Family

CAESALPINIACEAE

Habit and Habitat: A small low tree, in our state seldom reaching a height of 30 feet, with a maximum trunk diameter of 5-8 inches, commonly branching near the ground into numerous stout, straggling branches to form a broad, flat or more or less rounded crown, often low and bushy. Prefers the deep, rich and moist soil of the woodlands along streams and in rich river bottomlands where it is often seen in the shade of other forest trees.

Leaves and Buds: Leaves alternate, simple, 2-4 inches long and about the same in width, heart-shaped or rounded with an abruptly tapering point, entire, thick, smooth, dark green above, paler beneath, turning bright yellow in the fall. Petiole about one-half the length of the leaf. Lateral buds about $\frac{1}{4}$ inch long, obtuse, flattened and closely pressed against the twig, brown.

Flowers and Fruits: Flowers in late April or May, before the leaves, pink, pinkish-purple or dark red, about $\frac{1}{2}$ inch long, on short, jointed stalks in clusters of 2-8, very irregular in form, shaped like a pea or bean flower, perfect; sepals 5; petals 5; stamens 10, in 2 sets of 5 each; pistil 1. Fruit a short-stalked, flat, smooth, brown pod, 2-4 inches long, $\frac{1}{2}$ inch wide, pointed at both ends, remaining on the tree after the leaves have fallen; seeds 8-12, brown or olive-colored, very hard.

Bark, Twigs and Wood: Bark on twigs shiny, brown, becoming dark brown or deep reddish-brown and deeply fissured on the older branches and main trunk, and often more or less scaly, sometimes almost black. Twigs usually more or less zigzag bearing very small buds which are blunt and flattened. The wood is heavy and hard, coarse-grained, weak, dark reddish-brown, with thin lighter colored sapwood, not durable.

Distribution in State: Found naturally only in the southeastern corner of the state from Richardson county northward and westward to Lancaster and then northeastward to Douglas county. The red-bud is a tree which does not get away from the immediate vicinity of deep, moist woods although it is rather hardy elsewhere. It is not particularly abundant in any part of the state. Map 43.

Remarks: The red-bud is worthy of more attention from landscape architects and others interested in ornamental plants. It grows rapidly and is fairly hardy in the climate of eastern Nebraska. I would not recommend it for western Nebraska. It is very difficult to transplant successfully when old, so that best success is secured when the trees are set out when very young. The plants begin to produce flowers when only 4-5 years old or when 5-6 feet or less in height. The tree is particularly striking in early spring with its covering of myriads of pink flowers which contrast sharply with the dark brown twigs and trunks and which are especially noticeable at that time when out-of-door vegetation has scarcely begun to show the usual early summer green. I have seen the tree in full bloom during a late winter snow storm.

AILANTHUS OR TREE OF HEAVEN



1. Winter twig, x 1.
2. Leaf, x $\frac{1}{8}$.
3. Leaflet, x $\frac{1}{2}$.
4. Staminate flower cluster.
5. Staminate flower, enlarged.
6. Pistillate flower, enlarged.
7. Fruit, x 1.

(From Otis: Mich. Trees)

AILANTHUS OR THE TREE OF HEAVEN

Ailanthus glandulosa Desf.

The Ailanthus Family

SIMARUBACEAE

Habit and Habitat: A tall, bare and rapidly-growing tree reaching a height of 40-50 feet and a trunk diameter of 1-2 feet, with a spreading, open and loose crown composed of a few large, club-like branches and very coarse spray. This tree is planted in almost every conceivable situation and it does well everywhere except in the very driest and exposed sites. It grows well in the shade or in open sunlight.

Leaves and Buds: The leaves are alternate and pinnately compound, 1-3 feet long, with 11-41 leaflets, i. e. 5-20 pairs of lateral leaflets and one terminal leaflet, leaflets 2-6 inches long and about one-third as wide, tapering gradually to a more or less slender point, each with one or two coarse glandular teeth at base, smooth or velvety, dark green above, pale beneath, ill-smelling when crushed. The leaves are attached to the twigs by the very broad bases of the petioles so that when they fall, enormous leaf-scars are left which are more or less heart-shaped and sometimes an inch broad. The buds are small, globular, brown and downy. There are no terminal buds.

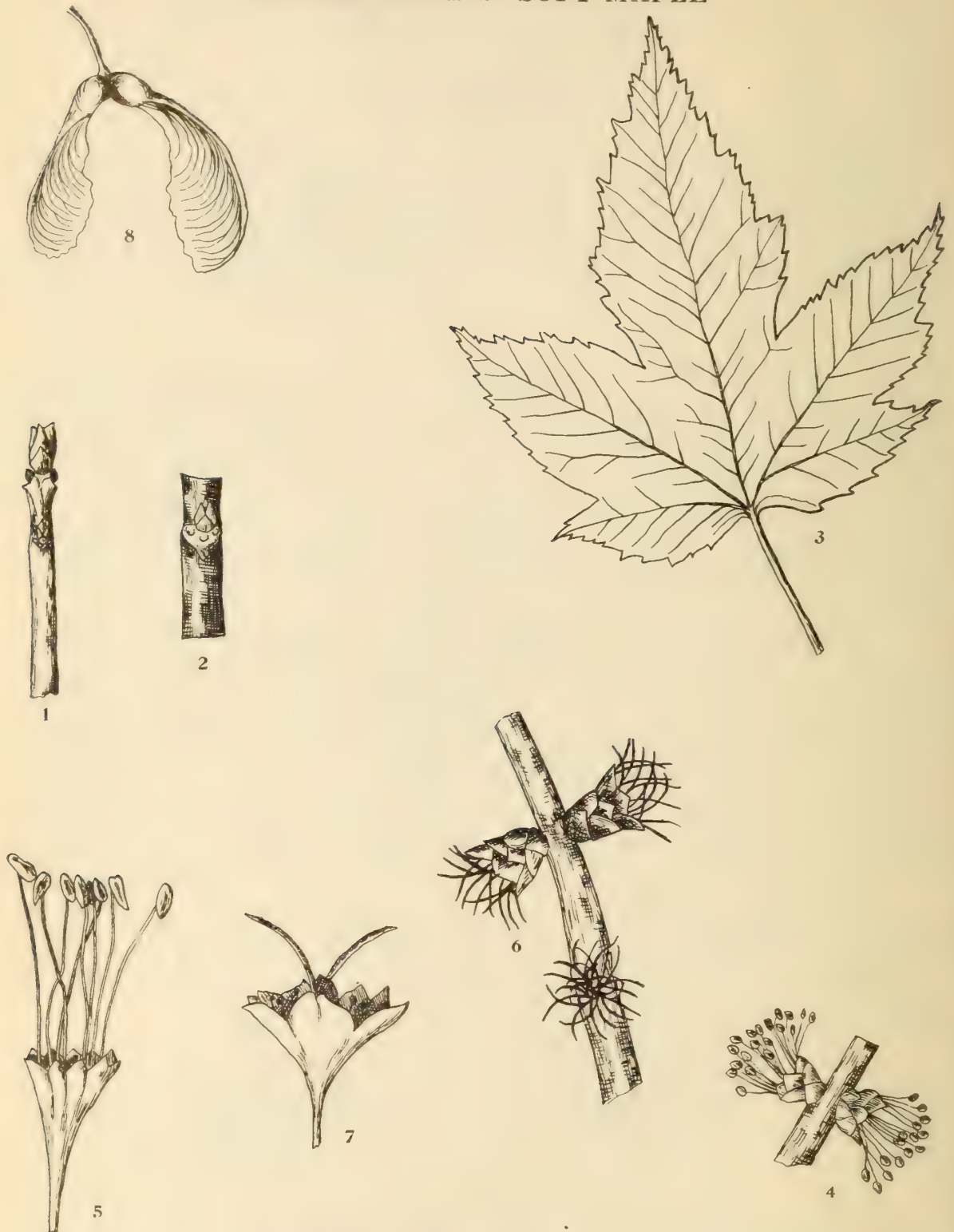
Flowers and Fruits: The flowers usually appear about the middle of June at Lincoln after the leaves are full grown, they are very small, yellowish-green and are borne in large upright, open clusters 6-15 inches in height, the staminate are very ill-scented. There are 5 sepals, 5 petals and 10 stamens in each flower, the staminate flowers do not have pistils. The fruits are produced in dense clusters and mature in late summer or early fall and each is composed of a dry twisted wing about 2 inches long and $\frac{1}{2}$ inch wide in the center of which is a single dry seed. When young the fruits are yellow-green, at maturity they are straw colored. They often persist upon the trees after the leaves have fallen.

Bark, Twigs and Wood: The bark on the twigs is usually reddish-brown or sometimes faintly pinkish, becoming grayish and shallowly and distantly fissured on the older branches and main trunk. The twigs are often more or less velvety, whitish or downy. The wood is pale yellow, satiny, coarse, soft, weak, and of very little value.

Distribution in the State: This tree is a native of China but has been naturalized in many parts of the earth where it escapes from cultivation along roadsides and in fields and gardens where it often spreads extensively by root suckers. It also seeds freely in some localities, as in Nebraska.

Remarks: This is one of our most beautiful ornamental trees because of its wealth of fern-like, dark-green foliage. The leaves are very bright and fresh in all kinds of weather from early summer and they are retained in the fall long after the leaves have fallen from many of our native trees. This tree in the winter condition is sometimes confused with catalpa, but there are so many points of difference between the two trees that there is really no excuse for confusing them.

SILVER MAPLE. SOFT MAPLE



1. Winter twig, x 1.
2. Portion of twig enlarged.
3. Leaf, x $\frac{1}{2}$.
4. Staminate flowering branchlet, x 1.
5. Staminate flower, enlarged.
6. Pistillate flowering branchlet, x 1.
7. Pistillate flower, enlarged.
8. Fruit, x $\frac{1}{2}$.

(From Otis: Mich. Trees)

SILVER MAPLE. SOFT MAPLE

Acer saccharinum L.

The Maple Family

ACERACEAE

Habit and Habitat: A large, beautiful tree, reaching a height of 60-80 or even 100 feet, with a trunk diameter of 2-4 feet; trunk soon dividing into 3-5 stout, upright, secondary stems with few lateral branches for considerable distance, forming a wide-spreading crown with many slender, drooping branches. When planted on both sides of a street the crowns often close over the street. Prefers low, rich and moist bottom-lands and alluvial flats but grows quite well upon rather dry uplands.

Leaves and Buds: Leaves opposite, simple, 3-7 inches long and almost as wide, palmately 5-lobed with narrow, acute indentations and pointed, sharply-toothed divisions, the middle lobe often being 3-lobed, base more or less heart-shaped, light green above, silvery white, but not hairy beneath, turning pale yellow in the fall; petioles long, slender, drooping, red, smooth. Flower buds in clusters, dark red, blunt, about $\frac{1}{4}$ inch long; leaf buds smaller, opposite, inner scales enlarging and becoming yellow in early spring.

Flowers and Fruits: Flowers appearing in March or early April, before the leaves, small; staminate yellow-green; pistillate reddish, in crowded, stalkless clusters; calyx 5-lobed, downy, long and narrow or short and broad; corolla 0; stamens 3-7, long; ovary hairy, 2-lobed, wing-margined; styles bright red. Fruit composed of two unequal wings joined together forming a maple "key", borne on slender drooping pedicels $1\frac{1}{2}$ -3 inches long, wings curving inward, $\frac{1}{2}$ - $\frac{3}{4}$ inch wide, greenish, yellow becoming light brown, seed germinating at once, not retaining its vitality for many days.

Bark, Twigs and Wood: The twigs are red or reddish-gray, and the bark on the larger branches is smooth or roughish, and pinkish gray, old trunks dark gray, more or less furrowed, the surface separating into large, thin, loose scales. Wood hard, heavy, strong, close-grained, brittle, pale brown, with thick lighter colored sapwood.

Distribution in the State: Occurs abundantly in the forests of Missouri from which it has extended up the Missouri river nearly to the mouth of the Niobrara and thence westward fifty to sixty miles, in the moist lands along the streams, and extending westward along the south border of the state to Thayer county. Found abundantly throughout the Mississippi valley where it is one of the largest and most common trees; rare along the Atlantic coast. Map 46.

Remarks: This is probably the most rapidly growing maple tree and is very desirable as an ornamental or fuel producing species. The silvery under surfaces of the leaves are particularly pleasing as the leaves are turned about by the breezes. This is the first native plant to bloom in Nebraska, it often being in flower late in February or early March at Lincoln. It is very hardy in this region and has become a deservedly popular tree for street and lawn planting, but it is rather easily injured and broken by the occasional ice storms and severe winds that visit our state. Maple sugar is sometimes made from the sap of this tree.

SUGAR MAPLE. HARD MAPLE



1. Winter twig, x 2.
2. Portion of twig, enlarged.
3. Leaf, x $\frac{1}{2}$.
4. Staminate flowering branchlet, x $\frac{1}{2}$.
5. Staminate flower, enlarged.
6. Pistillate flowering branchlet, x $\frac{1}{2}$.
7. Pistillate flower, enlarged.
8. Fruit, x 1.

(From Otis: Mich. Trees)

SUGAR MAPLE. HARD MAPLE

Acer saccharum Marsh.

The Maple Family

ACERACEAE

Habit and Habitat: A large tree, 60-100 feet tall, with a trunk diameter of 2-4 feet; stout upright branches forming a broad round-topped or oval crown when young and branched low down, in the forest producing a tall clean trunk with a narrow open dome-shaped crown with dense foliage. Prefers rich, moist soils in valleys and along stream courses, and moist rocky slopes; commonly grows in mixture with beech and hemlock forming a very shady forest with little undergrowth.

Leaves and Buds: Leaves opposite, simple, 3-5 inches long and of about same width, 3-5-lobed, the lobes very coarsely wavy-toothed, and pointed, the indentations rounded at the base, heart-shaped at the base, thin but firm, dark green above, paler and smooth beneath, turning yellow, orange, scarlet and crimson in autumn. Petioles long, slender, often reddish. Buds small, reddish-brown, smooth or somewhat hairy toward the top, the terminal bud about $\frac{1}{2}$ inch long, the lateral buds opposite, smaller, closely pressed against the twigs.

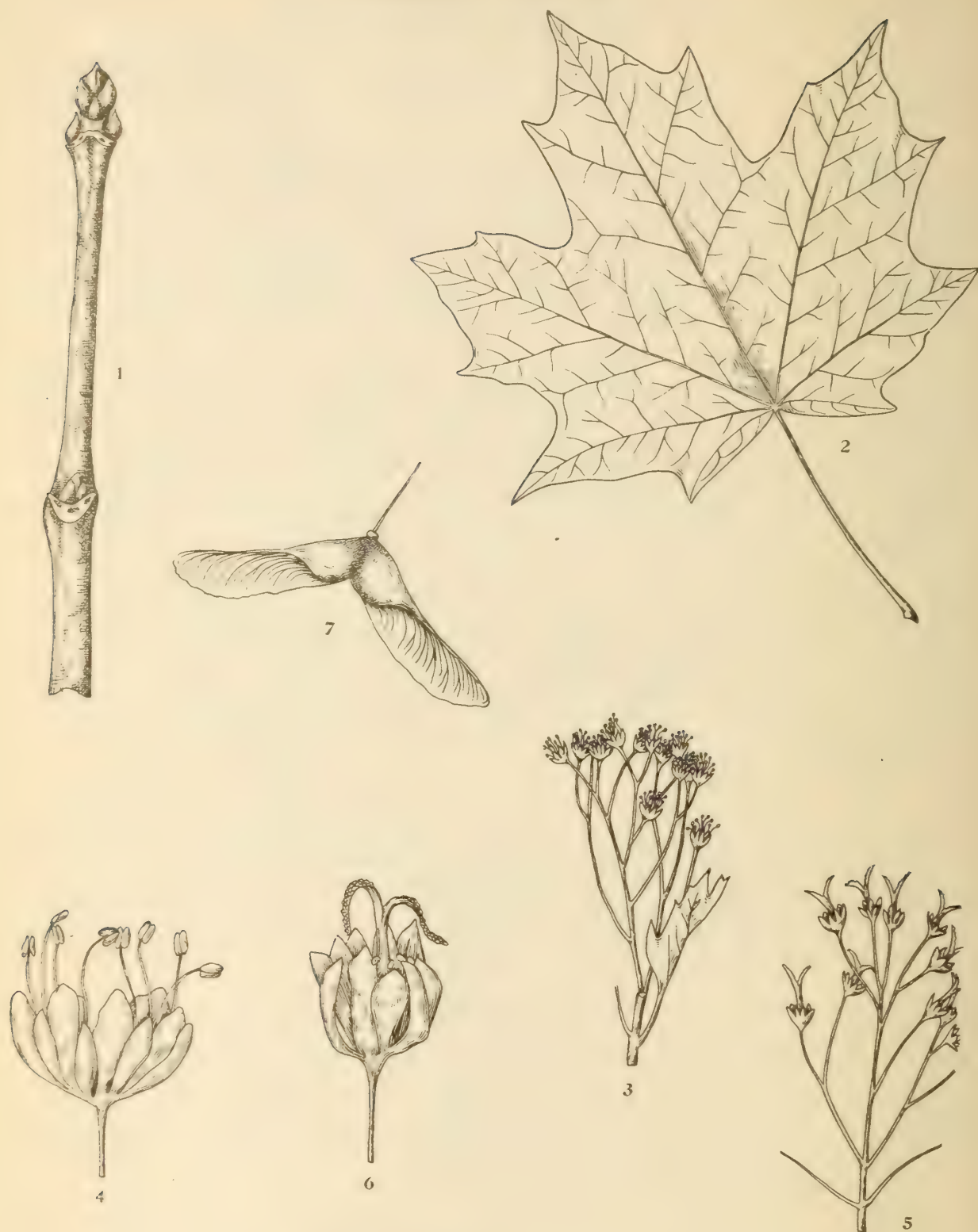
Flowers and Fruits: Flowers appearing in May with the leaves, in many-flowered clusters, some flowers fertile, some sterile, in separate clusters on the same or different trees, greenish yellow; calyx bell-shaped, 5-lobed; corolla 0; stamens 7-8, borne upon the calyx rim; ovary greenish, hairy. Fruit a "key" composed of a pair of brown, equal wings, each about 1 inch long, slightly divergent, and bearing a single, 2-lobed pod in the center, 1-seeded, ripening in late summer, germinating the following spring.

Bark. Twigs and Wood: Bark on young twigs and limbs smooth, pale brown or gray, deeply furrowed, often more or less shaggy by the separation of long, thick plates somewhat like the bark of the shagbark hickory. The wood is heavy, hard, strong, close grained, tough, light brown tinged with red, with thin, lighter colored sapwood, durable, capable of a fine polish; much used for the interior trim of buildings, flooring, furniture, tool handles, tooth picks, musical instruments, etc.

Distribution in the State: The sugar maple does not occur naturally in Nebraska, the nearest approach of its natural range being central Iowa. However, the species is planted rather commonly in eastern Nebraska where it does not do very well. The commonest exotic maple planted in this state is the Norway maple, a tree which looks much like the sugar maple and which often passes for the latter. The Norway maple is somewhat more hardy in our dry, hot summers than the sugar maple and so it is the better tree to plant.

Remarks: This tree furnishes the sap from which maple syrup and maple sugar are manufactured. Because of these delightful saccharine products and the wide uses of the wood the sugar maple is one of the most valuable broad-leaved trees in North America. The plain wood and the peculiar "bird's eye", "blister" and "curly" maple, all products almost exclusively of this species, command fancy prices in the wood markets of the world.

NORWAY MAPLE



1. Winter twig, x 1.
2. Leaf, x $\frac{1}{2}$.
3. Raceme of staminate flowers, x $\frac{1}{2}$.
4. Staminate flower, enlarged.
5. Raceme of pistillate flowers, x $\frac{1}{2}$.
6. Pistillate flower, enlarged.
7. Fruit, x $\frac{1}{2}$.

(From Otis: Mich. Trees)

NORWAY MAPLE

Acer platanoides L.

The Maple Family

ACERACEAE

Habit and Habitat: A medium-sized tree, with a height of 40-60 feet and a trunk diameter of 8-20 inches, the ascending and spreading stout branches forming a rounded or oval crown. Prefers rich moist soil but does well in rather dry sites; will endure greater extremes of environmental conditions than many other maple species.

Leaves and Buds: Leaves opposite, simple, 4-7 inches long and about the same in width, thin, smooth, bright green upon both surfaces, turning pale yellow in the fall, 5-7-lobed at maturity, the lobes remotely and coarsely toothed, teeth with long tapering points, separated by rounded scallop-like indentations; petioles long, slender, expanded at the base, exuding a milky juice when bruised. Winter-buds yellow-green, red or dull reddish-brown, terminal bud $\frac{1}{4}$ inch long, broad, short-stalked, bud-scales keeled, lateral buds smaller, appressed, buds exuding a milky juice when cut.

Flowers and Fruits: Flowers produced in May or June, before or with the leaves, large, yellowish-green, in short, erect, several-flowered clusters; sepals 5; petals 5; stamens 8. Fruit a double-winged, dry "key" like the fruit of the other maples, but with equal, widely divergent wings, pendulous on long stalks, ripens in the fall and germinates the following spring.

Bark, Twigs and Wood: The branchlets are at first green, shiny, becoming brownish; bark on the trunk dark gray and closely fissured, not shaggy or scaly. Wood hard, heavy, close-grained, light brown with almost white sapwood; used by the joiner, wheelwright and the wood carver for a great variety of purposes.

Distribution in the State: Norway maple does not occur naturally in Nebraska or, in fact, in any part of North America, but has come to us from Europe where it is found in abundance from Norway to Switzerland. The species is one of the commonest street trees in this country and it has also been widely planted in parks and upon private estates. Its roots are deeply penetrating and they also spread widely so that it is thereby particularly well equipped to survive the strenuous conditions of a city environment.

Remarks: The Norway maple resembles the common American sugar maple in a good many respects, but the acrid, milky juice which exudes from the broken petioles is usually sufficient to distinguish it from the American tree. The leaves remain upon the trees from ten days to two weeks longer in the autumn than is the case with our native maples. The tree has been much used as an ornamental tree in the northeastern states where it is long-lived and often planted in preference to the sugar maple. It is much more hardy than the sugar maple in Nebraska and is deserving of much wider use, especially as a street tree. There are many varieties of the Norway maple. The Schwedler maple is one of the commonest of these, a beautiful novelty with bright purple or crimson new growth, bark and leaves, which change later to a purplish green. Another purple-leaved variety holds its purple colors throughout the season and hence is always a striking feature of any landscape plan in which it is included.

BOX ELDER. ASH-LEAVED MAPLE



1. Winter twig, x 1.
2. Leaf, x $\frac{1}{2}$.
3. Staminate flowering branchlet, x $\frac{1}{2}$.
4. Staminate flower, enlarged.
5. Pistillate flowering branchlet, x $\frac{1}{2}$.
6. Pistillate flower, enlarged.
7. Fruit, x 1.

(From Otis: Mich. Trees)

BOX ELDER. ASH-LEAVED MAPLE

Acer negundo L.

The Maple Family

ACERACEAE

Habit and Habitat: A medium-sized tree, 25-40 feet tall, with a trunk diameter of 10-24 inches. The trunk is often ill-shaped, twisted, and gnarled, dividing near the ground into several stout, irregular, widely-spreading branches, forming a broad, open, unsymmetrical crown. Prefers a deep, rich and moist soil along stream courses and in valleys but will do well in almost any situation.

Leaves and Buds: Leaves opposite, pinnately compound. Leaflets 3-5, 2-4 inches long, $1\frac{1}{2}$ - $2\frac{1}{2}$ inches broad, ovate or oval, rounded or wedge-shaped at the base, coarsely and irregularly toothed above the middle, the terminal leaflet often being 3-lobed, smooth or more or less hairy at maturity, veins very prominent. Petiole long, slender, 2-3 inches long, bases enlarged and often hairy. Leaf scars crescent-shaped. Terminal bud $\frac{1}{8}$ - $\frac{1}{4}$ inch long, acute, with dull red scales, often whitish or minutely hairy, lateral buds smaller, obtuse.

Flowers and Fruits: Flowers produced in April, with or preceding the leaves, yellow-green, staminate and pistillate on different trees; staminate in open clusters borne on long, thread-like, hairy stalks; pistillate in narrow, greenish, drooping clusters with hairy stalks; calyx hairy, 5-lobed; corolla 0; stamens 4-6; ovary hairy, wing-margined. Fruit borne in drooping clusters with stalks 1-3 inches long, clinging to the tree until late in the fall or even through the winter, each of the double-winged "keys" $1\frac{1}{2}$ -2 inches long, with strongly curved wings, bearing a thread-like pedicel at the middle, mature in late summer.

Bark, Twigs and Wood: Bark on old branches and the main trunk pale gray or light brown, deeply fissured into ridges and more or less scaly; twigs pale to light green, or purplish, bluish or hoary, smooth, brittle. Wood light, soft, close-grained, weak, creamy white with thick, hardly distinguishable sapwood, sometimes reddish-streaked; of little value except for fuel, cheap wooden-ware and paper pulp.

Distribution in the State: The box elder is probably the most widely distributed American maple. Found in all parts of Nebraska and very widely and abundantly planted in this state. Map 47.

Remarks: The box elder is in reality a true maple but the pinnately-compound leaves have led many people to believe that it was a very different tree from our other common maples. The tree has been widely planted and esteemed as a street tree and for windbreaks in exposed situations, for which purposes it has been popular because of its rapid growth and relative hardiness. However, we have many better trees for street and lawn planting.

The mountain maple, *Acer glabrum* Torrey, should be mentioned in connection with our other maples. This is a large shrub or small tree growing naturally in the Rocky mountains and which has entered the western end of the state in Sioux and Scottsbluff counties. The trees are 12-25 feet tall with trunk diameter of 2-5 inches, often growing in clumps. The leaves are often very deeply 3-5 or 7-lobed.

OHIO BUCKEYE



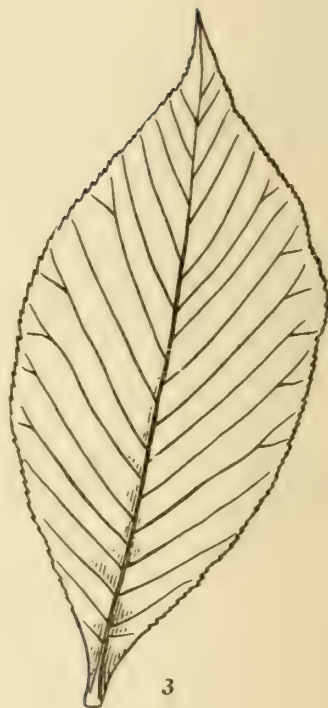
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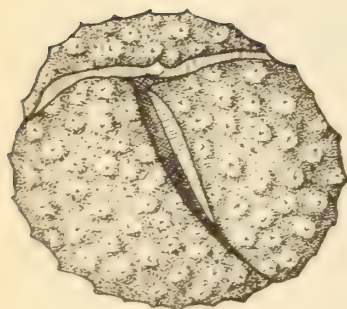
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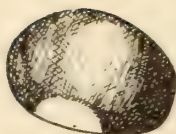
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3



5



6

1. Winter twig, x 1.
2. Leaf, x $\frac{1}{6}$.
3. Leaflet, x $\frac{1}{2}$.
4. Flower, x 2.
5. Fruit, x $\frac{1}{2}$.
6. Nut, x $\frac{1}{2}$.

(From Otis: Mich. Trees)

OHIO BUCKEYE
Aesculus glabra Willd.

The Buckeye Family
HIPPOCASTANACEAE

Habit and Habitat: A large shrub, or medium-sized tree, reaching a height of 20-40 feet and a trunk diameter of less than 2 feet, in Nebraska always a small, low tree or tall shrub. Usually grows in the moist soil of woods along river valleys and rich uplands, is seldom abundant anywhere. The spreading branches and thick twigs form a broad rounded crown.

Leaves and Buds: Leaves opposite, palmately or digitately compound, i. e., 'five-fingered'; leaflets 5, downy when young, 3-6 inches long, 1-2 inches broad, oval, gradually narrowed to the base, finely and irregularly serrate, smooth, yellow-green above, paler beneath, bright yellow in autumn; petioles long, grooved, slender, expanded at the base; leaves fetid when crushed. Terminal buds pale brown, $\frac{2}{3}$ inch long, acute; outer scales whitish; inner scales yellowish-green, enlarging in the spring, becoming 1½-2 inches long, and remain until leaves are about half grown.

Flowers and Fruits: Flowers produced in April, May or June, small, in large terminal clusters, 5-6 inches long, 2-3 inches broad, more or less downy; calyx bell-shaped, 5-lobed; petals 4, pale yellow, hairy, clawed, i. e. with a slender stalk-like base; stamens 7, with long hairy stalks which push the stamens beyond the limits of the corolla. Fruit maturing in October, a thick, leathery, prickly, brownish capsule or pod, globular, about 1 inch in diameter, containing one large smooth, shiny, chestnut-brown nut with a large, lighter colored scar at the base.

Bark, Twigs and Wood: Bark of the branchlets orange to brown, downy, later reddish-brown and smooth, marked with many lenticular spots, finally dark brown, on the old branches and main trunk dark gray, densely furrowed, and broken into plates, ill-smelling when bruised. The wood is white with light brown sapwood, light, soft, close-grained; used in the manufacture of wooden limbs.

Distribution in the State: The buckeye is a native of the lower Mississippi valley from which region it has spread widely into the adjacent states. It is quite common in the Missouri forests from which it has spread northwestward into southeastern Nebraska and has extended northward along the Missouri and Nemaha rivers through Richardson, Pawnee, and Nemaha counties. It is now fairly abundant in the neighborhood of Table Rock. It is occasionally planted in other parts of eastern Nebraska. Map 50.

Remarks: This interesting plant is called the Ohio buckeye because of the fact that it was reported by a certain early French botanist as especially abundant on the banks of the Ohio river between Marietta and Pittsburg. It is an easy transition from Ohio buckeye to Ohio, the Buckeye state. The large brown seeds or nuts of this species are popularly supposed to cure or to keep rheumatism away from the person who carries them continually, but this notion has no more scientific foundation than that the wearing of a brass or iron ring upon a certain finger will protect the wearer against the ravages of various terrible diseases.

HORSE CHESTNUT



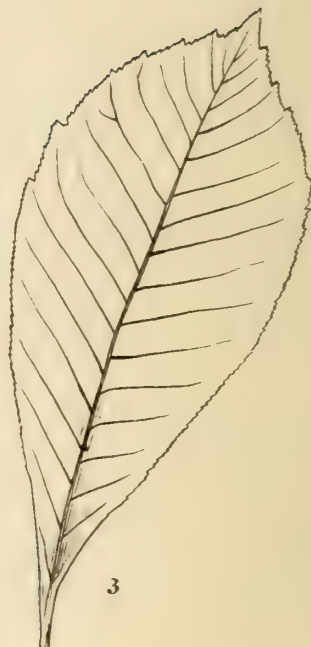
1



2



4



3



5

1. Winter twig, x $\frac{3}{4}$.
2. Leaf, x $\frac{1}{6}$.
3. Leaflet, x $\frac{1}{2}$.
4. Flower, x 1.
5. Fruit, x $\frac{1}{2}$.

(From Otis: Mich. Trees)

HORSE-CHESTNUT
Aesculus hippocastanum L.

The Buckeye Family
HIPPOCASTANACEAE

Habit and Habitat: A beautiful, coarse tree, reaching a height of 20-35 feet in our state and a trunk diameter of 10-18 inches, the many spreading and erect branches and twigs forming a handsome roundish or sometimes broadly conical crown; the twigs and spray are thick, blunt and clumsy. Prefers moist, rich soil but may be grown successfully in many different sites.

Leaves and Buds: Leaves opposite, palmately or digitately compound; leaflets usually 7, 5-7 inches long, 1-2 inches wide, broad above, wedge-shaped at the base, irregularly and bluntly serrate, thick, dark green and rough above, paler beneath, turning rusty yellow or brown in the fall; petioles long, stout, grooved, expanded at the base. Terminal buds $1\frac{1}{2}$ inches long, broad, acute, brownish or gray covered with waxy gum, downy in the interior; inner scales yellow, becoming $1\frac{1}{2}$ -2 inches long in spring, persisting until the leaves are half grown.

Flowers and Fruits: The flowers are produced in May or June after the leaves and are very showy, large, irregular, whitish or cream colored, produced in large, many-flowered upright clusters 6-10 inches long; calyx bell-shaped, 5-lobed; petals 5, white or yellowish, spotted with yellow and red, each with a claw, i. e., with a narrow stalk-like base; stamens 7, thread-like, extending beyond the flower. Fruit ripening in late summer or early fall, a brownish leathery, globular pod, 1-2 inches in diameter, covered with scattered, short spines, containing 1-3 large, smooth, shining, brown nuts.

Bark, Twigs and Wood: The bark on the twigs is smooth and reddish-brown, shiny, on the large branches and main trunk the bark is thick, dark brown and broken into thin plates by shallow fissures, becoming more or less scaly, or roughened with small excrescences, abounds in tannic acid and is fetid. The wood is white, light, soft, close-grained, weak, not durable in contact with the soil, of little value except for fuel.

Distribution in the State: This tree is a native of Greece and from thence it was introduced into Europe in the seventeenth century where it has been widely naturalized as a favorite tree for parks, lawns, and roadsides. It is extensively planted in America also where it is popular as a street and lawn tree and as such it is occasionally seen in eastern Nebraska.

Remarks: The horse-chestnut standing alone, with plenty of room on all sides, attains a natural form which is very attractive and effective. The trunk is short and erect, and the branches originate with such regularity that it develops a superb rounded or conical crown. The large scaly buds are particularly noticeable. The flowers of the tree are large and the flower clusters very prominent so that a large tree in full bloom is a magnificent sight. The popular notion that the large, chestnut-brown nut possesses the power to cure rheumatism if carried by the unfortunate sufferer from the disease is not at all supported by science. The tree is subject to a number of diseases which attack the leaves and often produce unsightly conditions.

AMERICAN LINDEN OR BASSWOOD



1. Winter twig, x 1.
2. Leaf, x $\frac{1}{2}$.
3. Cyme of flowers, with its bract, x $\frac{1}{2}$.
4. Flower, with two petals, petaloid scales and stamens removed, enlarged.
5. Stamen, enlarged.
6. Fruit, x $\frac{1}{2}$.

(From Otis: Mich. Trees)

THE AMERICAN LINDEN OR BASSWOOD

Tilia americana L.

The Linden Family

TILIACEAE

Habit and Habitat: A large tree, ranging in height from 50-60 feet with a tall, straight trunk 1-2 feet in diameter as it develops in this state. The rounded or spreading crown is formed from numerous, slender and more or less angular limbs densely arranged upon the several large branches. Found naturally only in rich moist woods and along river-bottoms in well-drained soils and where there is an abundance of light.

Leaves and Buds: The leaves are alternate, simple, 2-4 inches long and almost as wide as long, obliquely heart-shaped, coarsely toothed or serrate, thick and firm, smooth, dull, dark green above, pale beneath, veins very prominent; petiole slender, 1-2 inches long. Buds ovoid, acutely pointed, often lop-sided, smooth, dark red or ruby colored or greenish, $\frac{1}{4}$ inch long.

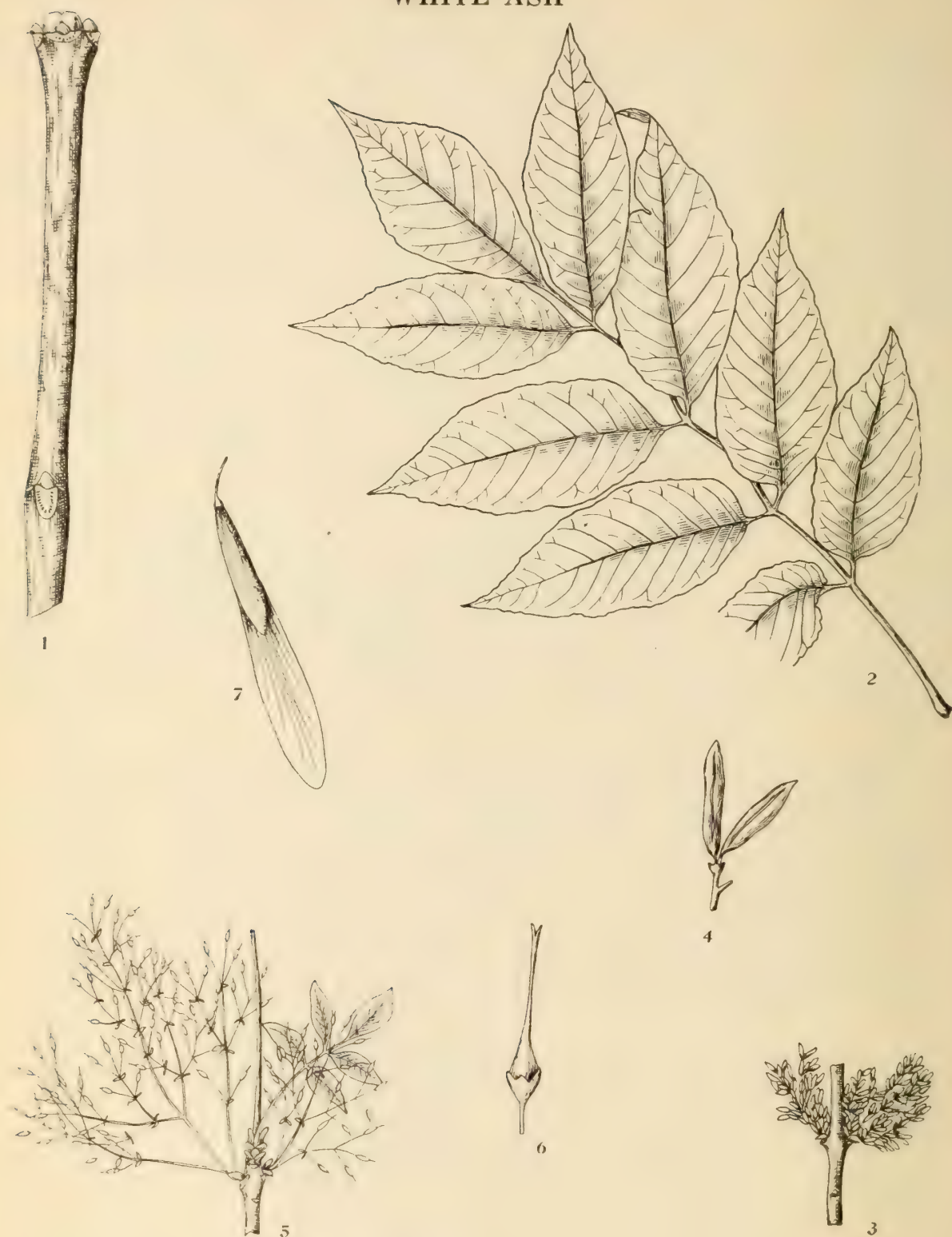
Flowers and Fruits: The flowers appear late in June or in July and are often produced in great profusion, after the leaves are fully grown, yellowish-white or greenish, downy, fragrant, produced in open, several flowered drooping clusters borne upon slender pedicels, the whole cluster attached by means of a slender peduncle to a narrow, oblong, yellowish, more or less leaf-like bract. Each cluster arises from about the center of the bract. Sepals 5, downy; petals 5, creamy white; stamens many; ovary globular, downy.

Bark, Twigs and Wood: The bark upon the twigs is smooth, reddish or gray, becoming dark gray or brownish, dark gray and smooth on young stems, and on old branches and the main trunk thick and deeply furrowed, the broad ridges becoming more or less scaly, the ridges usually flat-topped. The twigs are usually zigzag; leaf-scars oval or elliptical. The wood is soft light colored sometimes tinged with green or brown, even and fine-grained, tough, light, easy to work; used in the manufacture of paper-pulp and under the name of "whitewood" used in great quantities for woodenware, cheap furniture, panels of carriages, the interior woodwork of bureaus and dressers, toothpicks, etc. Not durable in contact with the soil.

Distribution in the State: Occurs in a narrow belt of woods from 20-50 miles wide from southeastern Nebraska along the Missouri river to the mouth of the Niobrara river thence up that river as far west as about central Cherry county; also along the Blue river in southern Nebraska and in Nance and Platte counties. Planted widely throughout the eastern half of the state where it does very well after once being established. Map 48.

Remarks: This is a rapidly growing tree and is very desirable as an ornamental and shade tree. It is easily moved and readily becomes established in a great variety of conditions, doing very well even in western Nebraska if watered frequently during periods of drought. It should be planted much more commonly as a street tree, being far superior to the introduced European linden for this purpose. It is a great honey plant and it is filled with bees when in blossom.

WHITE ASH



1. Winter twig, x 1.
2. Leaf, x $\frac{1}{4}$.
3. Staminate flowering branchlet, x $\frac{1}{2}$.
4. Staminate flower, enlarged.
5. Pistillate flowering branchlet, x $\frac{1}{2}$.
6. Pistillate flower, enlarged.
7. Fruit, x 1.

(From Otis: Mich. Trees)

WHITE ASH
Fraxinus americana L.

The Olive Family
OLEACEAE

Habit and Habitat: The white ash is naturally one of our large broad-leaved trees, but in Nebraska it seldom reaches a height exceeding 50-60 feet and a trunk diameter 15-20 inches; the few large branches and many slender twigs form an open, more or less pyramidal crown; the general branching effect is rather coarse. Prefers the rich, moist soil and well drained sites along stream courses and the deeper woods upon slopes; seldom seen in dry sites.

Leaves and Buds: Leaves opposite, pinnately compound, 8-12 inches long; leaflets usually 7-9, 2-4 inches long, 1-1½ inches broad, short stalked, broadly oval, tapering gradually to the tip, entire or slightly toothed, thick and more or less leathery, smooth, dark green above, pale beneath; petioles smooth, grooved. Winter-buds opposite, blunt, bud scales dark-brown or rusty, pointed, and with a keel on the back.

Flowers and Fruits: Flowers produced in late spring or early summer before the leaves, borne in loose or open clusters from the shoots of the previous year, staminate with a 4-lobed greenish calyx, bearing 2 stamens, pistillate on a different tree, with a greenish 4-lobed calyx and a 2-celled ovary. Both types of flowers are greenish and inconspicuous except as the clusters may be noticeable. The fruit matures in late summer and often persists upon the tree through the winter and into the following summer, each fruit is a dry paddle-shaped structure, 1-2 inches long, with a broad, flattened wing about ¼ inch wide which is attached near the tip of the elongated seed. These winged fruits, or samaras as they are called, are produced in crowded, drooping, straw-colored clusters.

Bark, Twigs and Wood: The twigs are green when young but gradually change to gray or light brown, and are often covered with a whitish or ashen "bloom". The bark on the older branches and main trunk is gray or yellowish-gray, deeply furrowed and ridged, the ridges being narrow and often flattened. The wood is heavy, hard, strong, coarse, tough, brown, with lighter colored sapwood, fairly durable.

Distribution in the State: White ash occurs naturally and in abundance in the forests of eastern United States. It has entered the southeastern corner of Nebraska from the forests of Missouri and has extended itself northward along the Missouri river and its tributaries to Sarpy and Douglas counties. The species is not plentiful in any portion of its range in this state, but is more frequently seen in the woods of the extreme southeastern corner than anywhere else. This is the most westerly extension of this eastern tree." Map 44.

Remarks: The white ash is probably the most desirable and popular of all the species of ash. It grows rapidly and is easily transplanted so that it is one of the commonest and best ornamental trees. It is not attacked by many serious diseases; it is usually clean and attractive and may be used very satisfactorily in a variety of landscape plans. The white ash is not quite so hardy in Nebraska as some of the other ashes.

RED ASH



1. Winter twig, x 1.
2. Leaf, x $\frac{1}{3}$.
3. Staminate flowering branchlet, x $\frac{1}{2}$.
4. Staminate flower, enlarged.
5. Pistillate flowering branchlet, x $\frac{1}{2}$.
6. Pistillate flower, enlarged.
7. Fruit, x 1.

(From Otis: Mich. Trees)

RED ASH

Fraxinus pennsylvanica Marsh.

The Olive Family

OLEACEAE

Height and Habitat: The red ash is about the same sized tree as the white ash in our state, 50-60 feet tall, with a trunk diameter of 12-18 inches. The several stout, upright branches, and the coarse twigs form a compact, broad, and irregular crown. In the open the crown becomes beautifully rounded and symmetrical. This species also prefers the moist loamy soil of river banks and river bottoms, but it is sometimes seen in rather marshy sites. It does not do so well in dry, open sites.

Leaves and Buds: The leaves are opposite, pinnately compound, 6-12 inches long; leaflets 7-9, commonly 7, 2-4 inches long, 1-1½ inches wide, short-stalked, oblong, gradually tapering, entire or slightly serrate, thin and firm, leathery when dry, smooth and yellowish-green above, pale and downy beneath; petioles and midribs hairy.

Flowers and Fruits: Flowers produced in May as the leaves are unfolding, borne in dense, downy clusters on the shoots of the previous year; the calyx is shallow, cup-shaped, 4-lobed or toothed; corolla 0; stamens 2; ovary 2-celled. As in the white ash the staminate and pistillate flowers are borne by different trees. The fruits are also more or less paddle-shaped as in the white ash but in the red ash the flat wing extends as two narrow flanges for some distance along the seed back from the tip, and the wing is commonly longer and narrower also. The dense clusters of fruits often cling to the twigs throughout the winter or even for a full year after they are formed.

Bark, Twigs and Wood: The twigs are pale and downy when young, finally after 1-3 years becoming ashy or gray or brownish and often covered with a grayish or whitish "bloom"; bark on old branches and main trunk dark yellowish gray, with close-fitting shallow, longitudinal furrows and ridges, becoming somewhat scaly. The wood is heavy, hard, strong, coarse-grained, light brown, with broad yellowish sapwood; often used for fence posts and stove wood in our state.

Distribution in the State: This species has also entered the state from the southeast and has spread along the stream courses as the chief lines of dispersal entirely across the state where it is found in a great variety of sites often quite different from those which the species really prefers. The species has been planted very commonly and widely in Nebraska as a shade and ornamental tree for which purposes it is very adaptable. Map 45.

Remarks: The red ash was used quite extensively by the earlier settlers of Nebraska for planting on their "timber claims". This was particularly true for central to western Nebraska where the red ash and common cottonwood were the commonest species used for such purposes. Many of the timber claims groves of red ash are now in very bad condition because they have not been cared for at all; stock and fires have been allowed free access to the plantations and these conditions together with the rather severe climatic and soil conditions have resulted in serious depletion of the groves and deterioration of the trees.

GREEN ASH



- 1 Winter twig, x 1.
2. Leaf, x $\frac{1}{3}$.
3. Staminate flowering branchlet, x $\frac{1}{2}$.
4. Staminate flower, enlarged.
5. Pistillate flowering branchlet, x $\frac{1}{2}$.
6. Pistillate flower, enlarged.
7. Fruit, x 1.

(From Otis: Mich. Trees)

GREEN ASH

Fraxinus lanceolata Borck.

The Olive Family

OLEACEAE

Habit and Habitat: A medium sized tree, 30-50 feet tall, with a trunk diameter of 12-15 inches, and with stout ascending branches and naked branchlets forming a compact, broad and roundish crown, especially when grown in the open or as a street tree. Prefers the moist, well-drained and rich loam of woodlands and river bottoms, but grows well in drier sites also.

Leaves and Buds: The leaves are opposite, pinnately compound, 8-12 inches long; leaflets 7-9, most commonly 7, 2-4 inches long, $\frac{3}{4}$ -1 inch broad, oblong-lanceolate, with gradually tapering tips, sharply serrate or entire, bright-green and smooth on both sides, not hairy underneath; petioles stout, more or less grooved, not hairy. The buds are opposite, stout, flattish; scales rusty-brown, hairy.

Flowers and Fruits: The flowers and fruits are essentially the same as those of the red ash. Rather frequently fruits of the green ash are found that are three sided rather than flat.

Bark, Twigs and Wood: The bark on the twigs is light green and smooth at first, but becomes ashy gray or yellowish-brown after three or four years old, brownish or gray on the old branches and main trunk, and divides into shallow, longitudinal furrows and ridges which often become more or less scaly in old age. When chipped away with a knife the interior of the bark appears bright straw-colored or yellowish-brown. The wood is heavy, hard, strong, coarse-grained, easy to split, light brown with thick greenish sapwood, quite durable in contact with the soil, good for posts and poles, tool handles and singletrees.

Distribution in the State: This is another tree that has entered Nebraska from the forests of the east and has worked its way entirely across the state. It is seen most commonly in the border-woodlands along the rivers and small streams but it also gets far away from such natural and more congenial habitats. Green ash was also used as a common timber claim tree during the period of the most rapid settlement in Nebraska. Green ash grows rapidly, is hardy in our climate, and has very desirable habits so that it has been very commonly planted as a street and lawn tree. It is easily transplanted and is seldom injured by our severest winter storms. The trunk is sometimes infested with borers but those are about the only serious pests that attack the tree. Map 45.

Remarks: Some authorities have concluded that this species is not distinct from the red ash and they are therefore inclined to include this as a mere variation under the *Fraxinus pennsylvanica* which is not deserving of separate recognition or of a separate name. Nebraska botanists have attempted to distinguish between the two, however. The absence of pubescence from the twigs, leaflets and petioles, the narrower and more distinctly serrate leaflets would seem to afford characteristics sufficient to separate the two species. These differences are more pronounced than those used to separate some of the species of other groups. However, this controversy is worth further investigation in connection with the species of ash as they are found in this state.

HARDY CATALPA



1. Winter twig, x 1.
2. Leaf, x $\frac{1}{4}$.
3. Cluster of flowers x $\frac{3}{8}$.
4. Fruit, or pod, x 1.
5. Seed, x 1.

(From Otis: Mich. Trees)

HARDY CATALPA
Catalpa speciosa Warder

The Trumpet-creeper Family
BIGNONIACEAE

Habit and Habitat: A tree, reaching a height of 30-40 feet with us, occasionally taller, with a short, often crooked trunk bearing a broad, rounded, open crown composed of several spreading branches and many thick, clu-like branchlets and twigs; sometimes the trunk is quite straight and tall, but with rapid taper. Prefers moist, rich soils and an abundance of light. Develops ideally in the lowlands of southeastern Nebraska.

Leaves and Buds: Leaves opposite or whorled, simple, 4-10 inches long, 3-8 inches broad; heart-shaped, entire or occasionally somewhat notched or lobed, smooth and dark green above, downy beneath; petioles long, stout, cylindrical, with a broad base; leaves turning dark brown or black as they fall after heavy frost. Buds small, brown, globular, often scarcely visible above the large circular leaf scars.

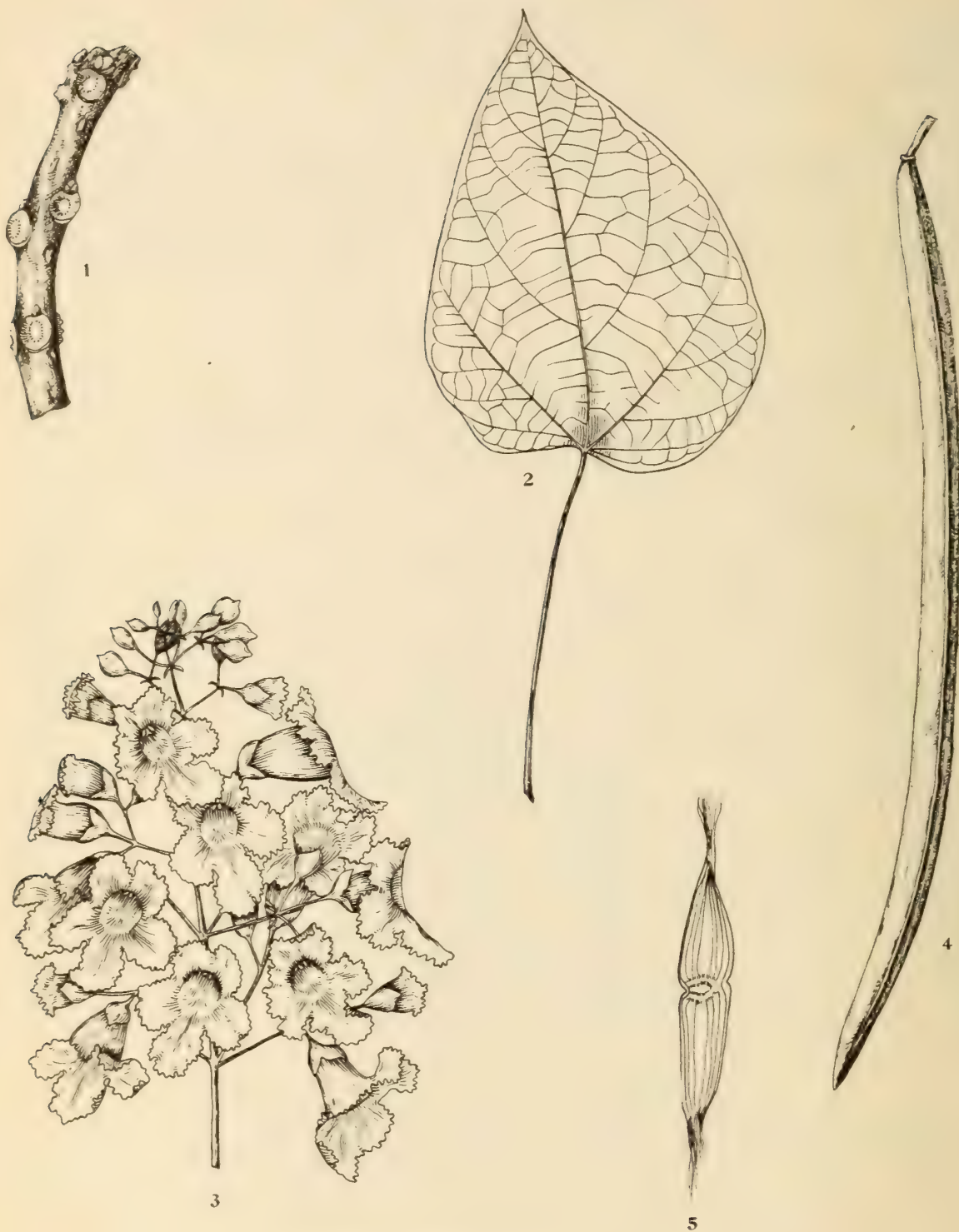
Flowers and Fruits: Flowers in midsummer, after the leaves are full grown, borne on slender more or less purplish pedicels in broad, loosely flowered clusters 5-6 inches long; calyx 2-lobed, purplish; corolla white with prominent yellow spots, bell-shaped, 5-lobed, 1-2 inches broad, with irregularly toothed or fringed margins, fertile; stamens 2; ovary 2-celled. The fruit is a long, slender pod or capsule about $\frac{1}{2}$ inch thick and 6-15 inches long, ripening in early fall, but often hanging on the tree all winter, or shedding the seeds during the winter, each pod containing many light brown or tawny seeds about 1 inch long, and $\frac{1}{4}$ inch wide, with rounded, hairy-fringed wings at each end.

Bark, Twigs and Wood: The bark on the twigs is greenish, often more or less purplish, becoming reddish-brown and covered with a thin grayish or whitish bloom in the first autumn, dark brown when older, thick, scaly and light brown on the older branches and the main trunk. The lateral buds are brownish, small and inconspicuous; terminal bud absent. The wood is light, coarse-grained, annual rings very distinct and usually wide, light brown; sapwood very thin and almost white, soft, weak; very durable in contact with the soil, works easily and takes a fine finish.

Distribution in the State: A native of the Ohio valley and the southeast, but has been planted very widely in almost all parts of the United States. It is not hardy in the northern states, but does very well indeed in southern and eastern Nebraska when planted in moist rich soil. Does not do well in central, northern or western Nebraska.

Remarks: There is no better tree than this to plant in the southeastern section of Nebraska for fence posts and poles. I would not recommend it for planting north of the Platte river or west of Hastings. It should always be planted in low, moist, well-drained sites. The best method in growing hardy catalpa for posts is to cut back the young trees to the ground at the end of the first or second season and then thin out all but one or two of the best sprouts. This method will produce much better trees for posts and poles. Because of the rapid growth, ease of culture, and durability of wood, this is really our best tree to plant for fence posts.

CATALPA



1. Winter twig, x 1.
2. Leaf, x $\frac{3}{8}$.
3. Cluster of flowers, x $\frac{1}{3}$.
4. Fruit, or pod, x $\frac{1}{2}$.
5. Seed, x 1.

(From Otis: Mich. Trees)

CATALPA

Catalpa bignonioides Walt.

The Trumpet-creeper Family

BIGNONIACEAE

Habit and Habitat: This tree is usually smaller than the hardy catalpa as the two species grow in this state. The tree is 25-40 feet high, with a short, thick trunk, often branched low down into an irregular crown of crooked and angular branches and twigs. This species also requires moist rich soils for its best development and an abundance of light under which conditions it is a rapidly growing tree.

Leaves and Buds: Leaves opposite or whorled, simple, 3-8 inches long, 2-6 inches broad, heart-shaped, entire or occasionally coarsely notched or lobed, thin and tough, smooth and light green above, paler and downy beneath, turning dark, often almost black, and falling rapidly after the first severe frost; petioles long and stout, cylindrical; buds brownish, globular, not prominent.

Flowers and Fruits: Flowers appearing in mid-summer, when the leaves are full grown, produced upon slender pedicels in compact, many-flowered clusters, 6-10 inches long; calyx green or purplish, 2-lobed; corolla white with yellowish spots, bell-shaped, 5-lobed, irregular in shape; fertile stamens 2; ovary 2-celled. Fruit ripening in early fall, but often remaining on the tree throughout the winter in Nebraska, a slender, 2-celled, cylindrical, more or less curved pod, 6-15 inches long and about $\frac{1}{4}$ inch thick, opens in spring and sheds many of the seeds before falling; seeds abundant, tawny or grayish, 1 inch long, with more or less penciled or pointed, fringed wings at each end, seed near the middle between two opposite notches in the wing.

Bark, Twigs and Wood: The bark of young twigs is green or tinged with purple, later becoming reddish-brown, often more or less ridged, reddish or yellowish brown on the main trunk, and often separating into large, thin, irregular scales; twigs coarse and stubby; wood light, soft, weak, coarse, light brown, with thin, almost white sapwood, very durable in contact with the soil.

Distribution in the State: This tree is a native of the lower Mississippi valley, but has been introduced and planted widely in many northern and eastern states. It is almost as popular as a shade and ornamental tree as the hardy catalpa in Nebraska, but is not so hardy in our climate as the latter species. However, this tender species of *Catalpa* does very well in moist sites in southeastern Nebraska where it has been planted very commonly.

Remarks: The wood of this species is practically as good for fence posts as that of the hardy *Catalpa*, but because of its slower rate of growth and less hardy nature is not to be recommended when the hardy species may be secured. The tree should be handled in plantations about the same as for the hardy catalpa. This tree is often confused with the hardy catalpa and sometimes it is difficult for even the expert to be sure of his identifications. The best point for separating the hardy from the tender species is based upon the septum or the partition in the fruit about which the seeds are produced. In the hardy species this septum is very broad and plump as seen in a cross-section while the septum of the tender catalpa pod is quite slim or narrow as seen in section.

RUSSIAN OLIVE



1. Winter twig, x 1.
2. Leafy branchlet with flower, x 1½.
3. Peltate scale from the leaf, enlarged.
4. Vertical section of flower, enlarged.
5. Mature fruit, x 2.

(Original)

RUSSIAN OLIVE
Elaeagnus angustifolia L.

The Oleaster Family
ELAEAGNACEAE

Habit and Habitat: A good-sized tree, reaching a height of 15-30 feet and a trunk diameter of 3-10 inches; erect or commonly leaning or twisted and distorted, producing irregular and often unsightly tree; branching low down to form a number of erect or pendulous, irregular, often spiny branches to which the many slender lateral twigs and spray cling for several years thus producing a more or less bushy irregular crown. Grows best and produces the more shapely forms in moist rich soil in open sunlight, but planted in many different sites.

Leaves and Buds: Leaves alternate, entire or sometimes deeply lobed, lance-shaped, narrowed at the base, obtuse or acute at the tip, grayish-green with scattered stellate hairs on upper surface, silvery gray beneath, often dark green above, 1-4 inches long, $\frac{1}{2}$ - $\frac{5}{8}$ inch wide; petioles short, stout. Winter buds $\frac{1}{8}$ - $\frac{1}{4}$ inch long, silvery gray with prominent peltate scales, strongly divergent from the twigs.

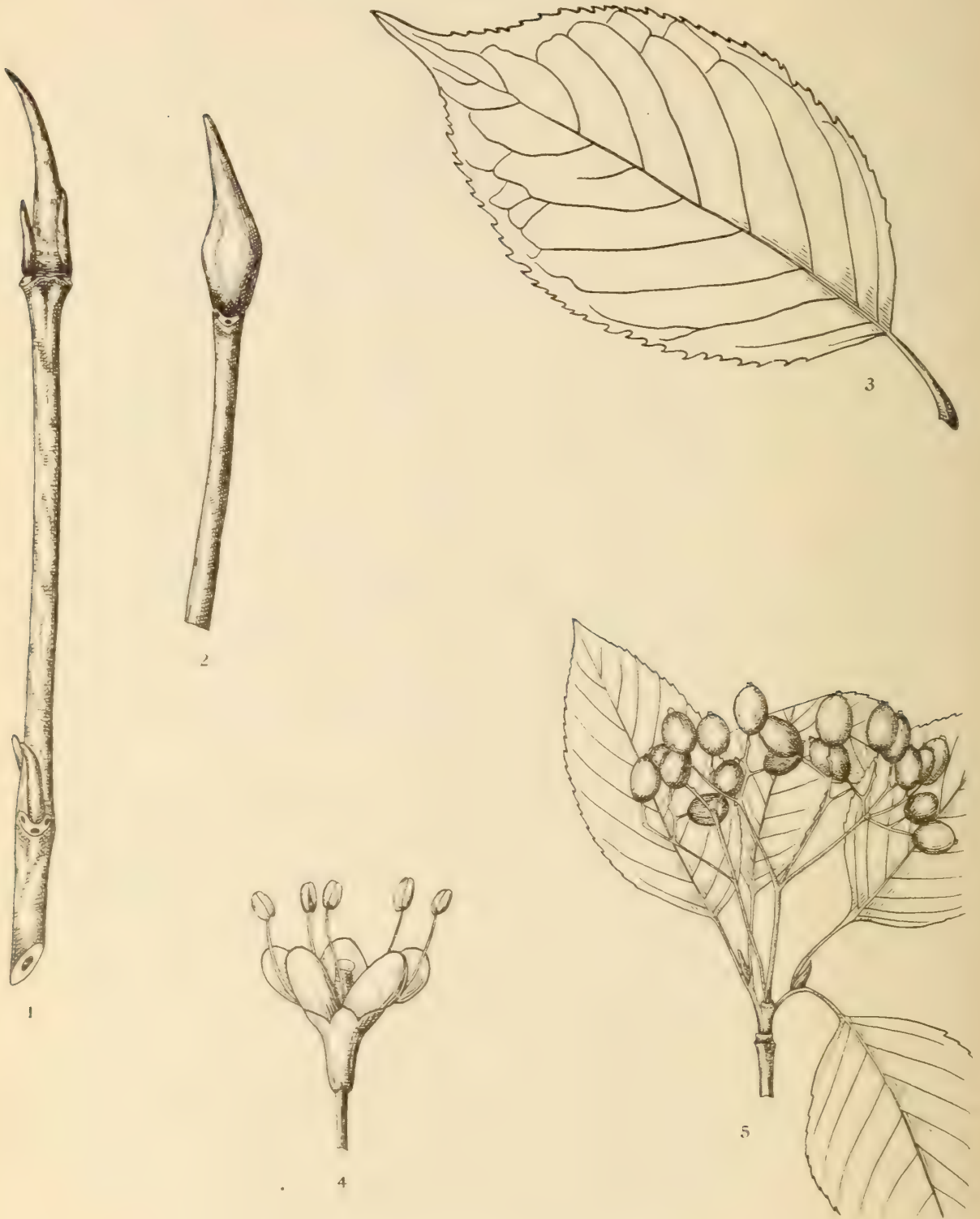
Flowers and Fruits: Flowers appearing in June; 1-few in the axils of the leaves on very short pedicels, calyx tubular or bell-shaped, $\frac{1}{4}$ - $\frac{1}{2}$ inch long, $\frac{1}{4}$ inch broad, 4-lobed, silvery-gray on the outside, lemon-colored within, very fragrant, petals lacking, stamens 4, very short, attached near the throat of the calyx. The fruit is an olive-shaped, or oblong structure about $\frac{1}{2}$ inch long and about half as thick, with a silvery-gray, thin skin covering a thin layer of mealy tissue which surrounds the oblong, brown and yellow, streaked stone, often persisting upon the trees until late fall or into the winter.

Bark, Twigs and Wood: Bark on two year old twigs smooth, shiny, olive colored to dark brown; young shoots silvery gray and densely covered with stellate hairs; most of the many current shoots die in the fall and many of these may persist for several years, gradually weathering away to produce numerous thorns or spines on the younger twigs. The bark on the older branches becomes smooth, shiny and very dark brown, and on the main trunk and its major subdivisions it becomes shallowly furrowed and more or less shreddy or stringy and dark reddish-brown or almost black. The wood is dark brown, light, weak, coarse-grained, easily split and fairly durable in contact with the soil.

Distribution in the State: The Russian Olive is a native of southern Europe and western Asia but has been introduced and naturalized in many portions of the United States, where it is hardy and has been planted very widely as an ornamental shrub or tree. It grows well in practically all parts of this state but does best in the eastern counties where it has been planted as a lawn and park tree.

Remarks: Although this tree is called the Russian olive it must be understood that it is not a true olive at all, although the dry, mealy fruit does somewhat resemble the olive of commerce in shape and structure. The tree is an excellent one for ornamental purposes because of the wealth of silvery gray foliage and the fragrant flowers. It is a rapidly growing tree and is easily transplanted.

NANNYBERRY. BLACK HAW



1. Winter twig, with leaf buds, x 1.
2. Winter twig, with flower bud, x 1.
3. Leaf, x $\frac{3}{4}$.
4. Flower, enlarged.
5. Fruiting branchlet, x $\frac{1}{2}$.

(From Otis: Mich. Trees)

NANNYBERRY. BLACK HAW

Viburnum lentago L.

The Honeysuckle Family

CAPRIFOLIACEAE

Habit and Habitat: A small tree, or large shrub, reaching a height of 15-25 feet, with a short trunk 3-8 inches in diameter; more often a shrub in this state; the numerous irregular branches produce a spreading rounded crown. Prefers the rich, moist loam of the woodlands along streams and river bottoms; seldom seen far beyond the limits of the natural forest unless planted.

Leaves and Buds: Leaves opposite, simple, 2-3½ inches long, about one-half as broad, broadly oval to almost orbicular, rounded at the base, finely and sharply serrate, thick and firm, bright green and shiny above, pale and marked with tiny black dots beneath, or rarely slightly hairy; petioles broad, grooved, flattish, about 1 inch long. Leaf-buds narrow, sharp-pointed, red, scurfy, ½ inch long; flower-buds swollen at base, with long neck-like point, grayish, ¾ inch long.

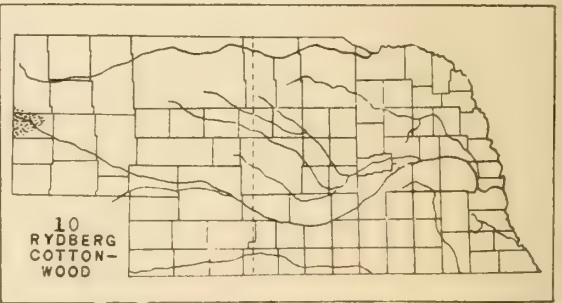
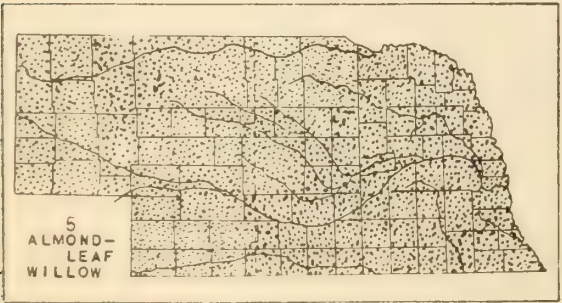
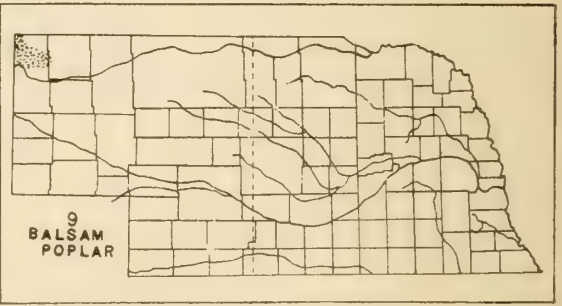
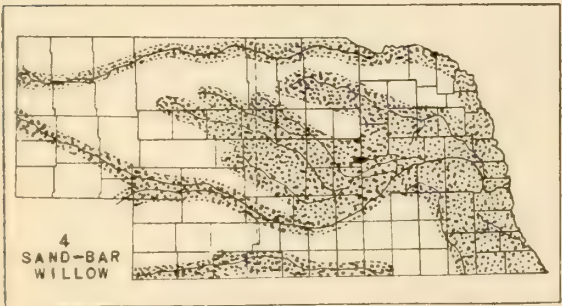
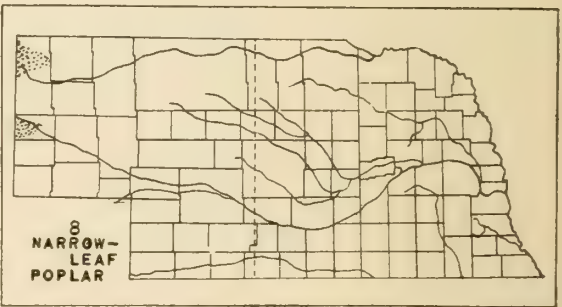
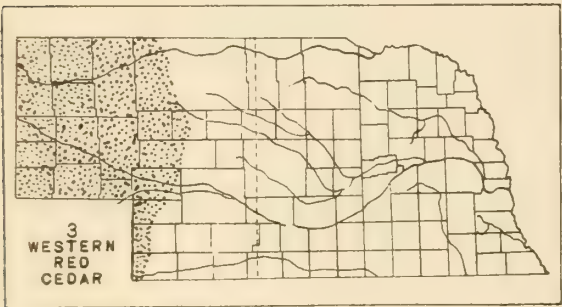
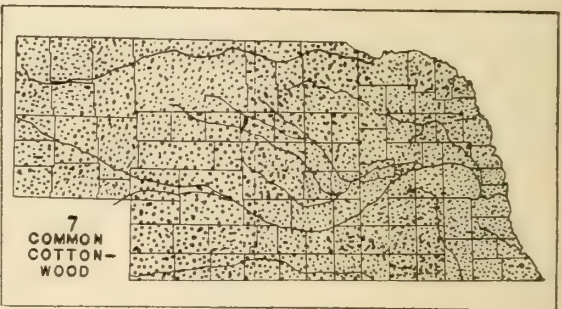
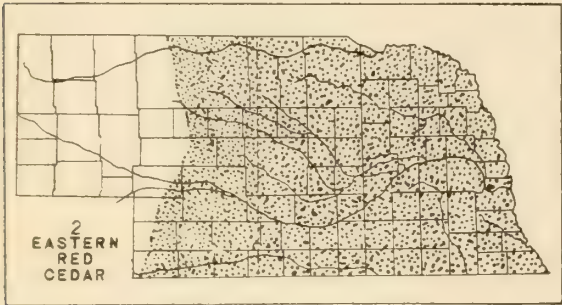
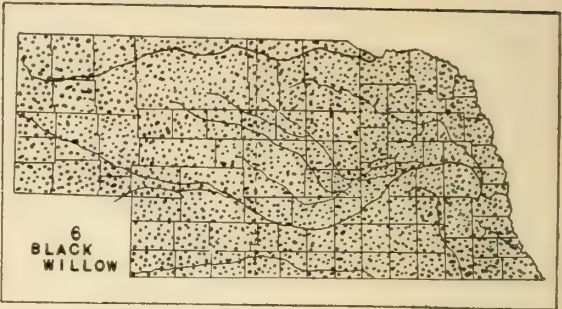
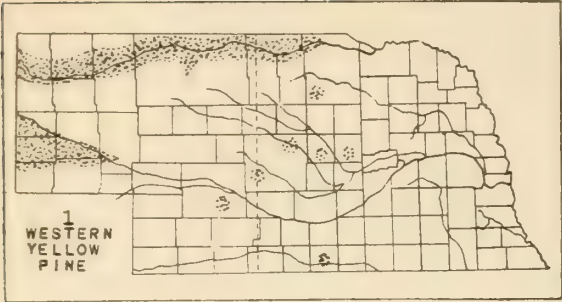
Flowers and Fruits: Flowers produced in June after the leaves are full grown, perfect, small, creamy-white, borne in much-branched clusters, 3-5 inches across; calyx tubular, 5-toothed; corolla 5-lobed, creamy or white, about ¼ inch wide; stamens 5; ovary 1-celled, thick and green. Fruit a fleshy plum-like structure ½ inch long, flattened, bluish-black, borne in few-fruited, red-stemmed clusters; stone oval, flat, rough; flesh sweet, edible, ripens in September or October.

Bark, Twigs and Wood: Twigs light green at first, more or less rusty-hairy, becoming reddish-brown; bark on old stems and main trunks dark brown with reddish tinge and broken into small thick plates, becoming more or less scaly. Wood dark orange-brown, heavy, close-grained, hard, ill-smelling; sapwood thin, whitish.

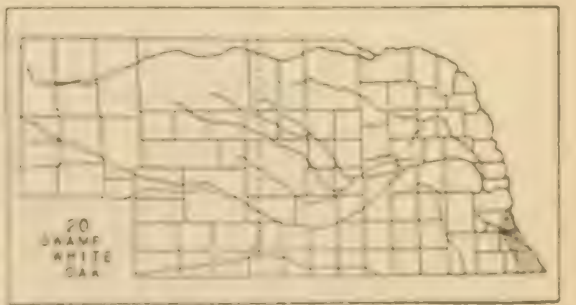
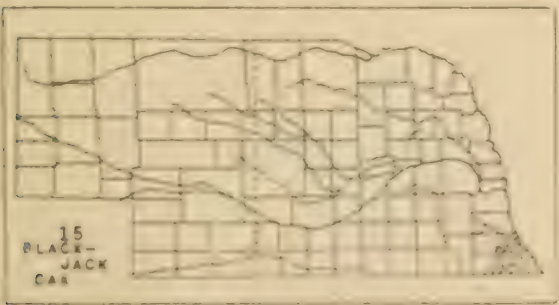
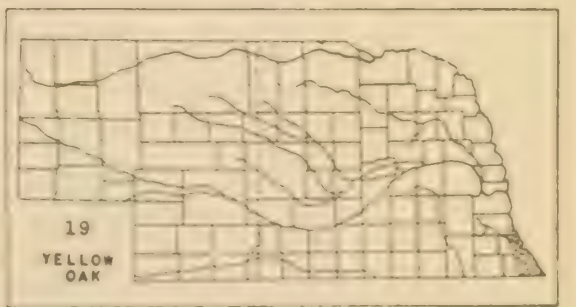
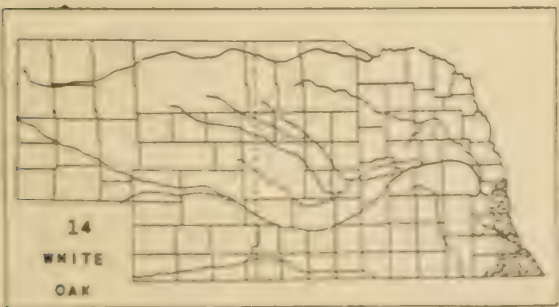
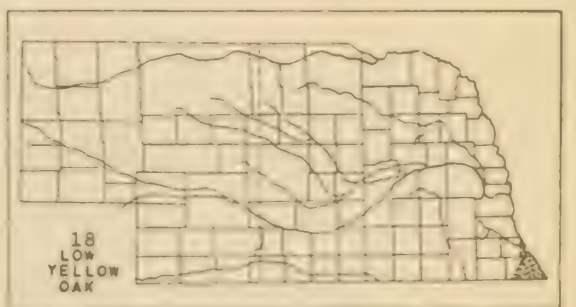
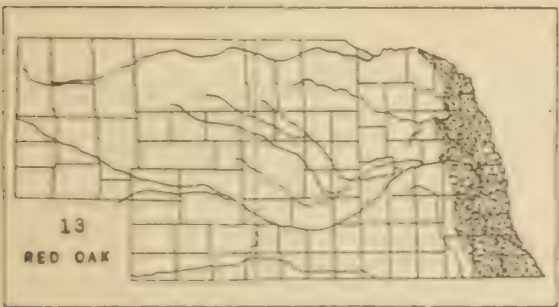
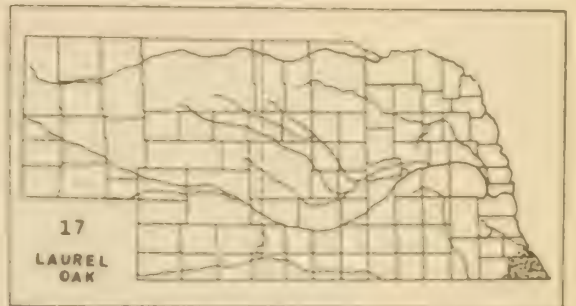
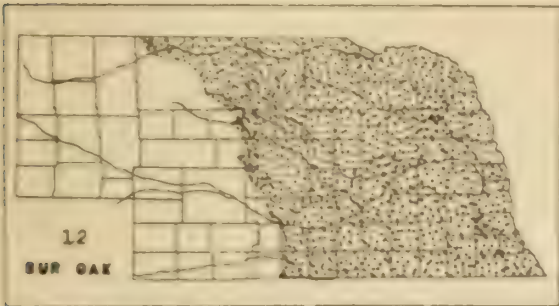
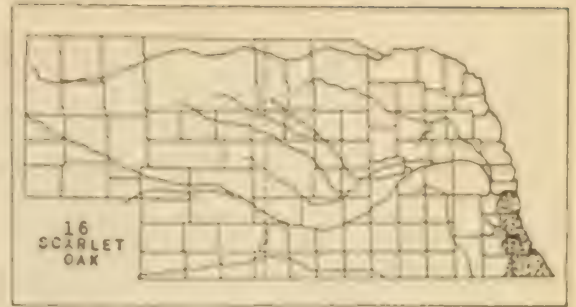
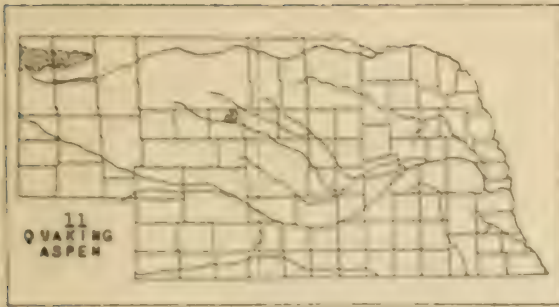
Distribution in the State: The nannyberry has come into Nebraska only in the southeastern corner of the state and has extended its range to the Platte river in Cass county. It is abundant in the forests of Missouri and farther eastward. The juicy fruits are eagerly sought by the birds. The species is occasionally seen in public parks and private grounds.

Remarks: This species is the largest of a number of species of *Viburnum* which occur in eastern and southern United States. In the east it is planted quite commonly as an ornamental where it is admired for its compact habit and its lustrous foliage. Its flowers are abundant and beautiful and the whole plant is brilliantly colored in the autumn. The species is readily transplanted and is very hardy so that it is an excellent small tree for general out-of-door decoration in parks and gardens in all parts of eastern and northern United States. It is easily raised from seeds, but if propagated in this way it must be borne in mind that the seeds do not germinate until the second year after they are planted. This species is worthy of wide planting throughout eastern Nebraska.

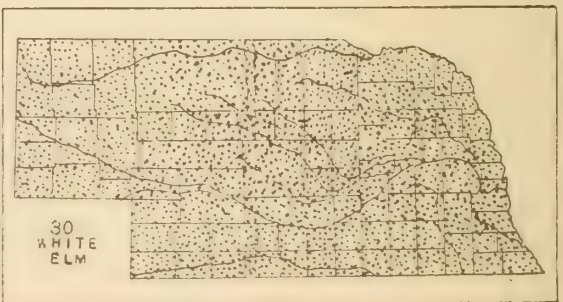
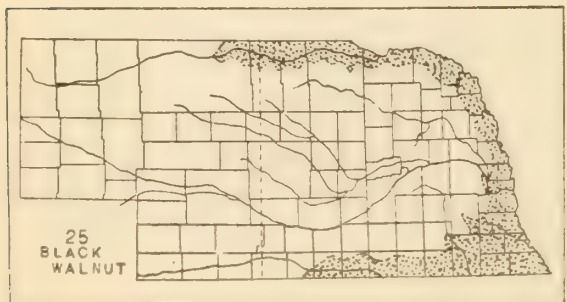
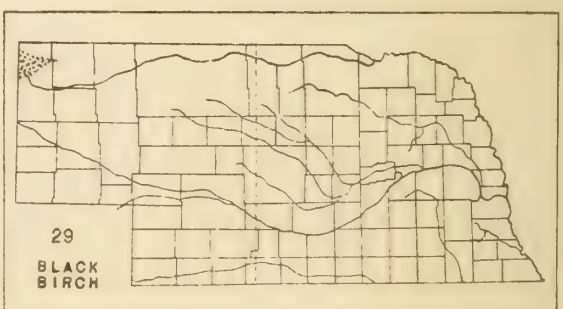
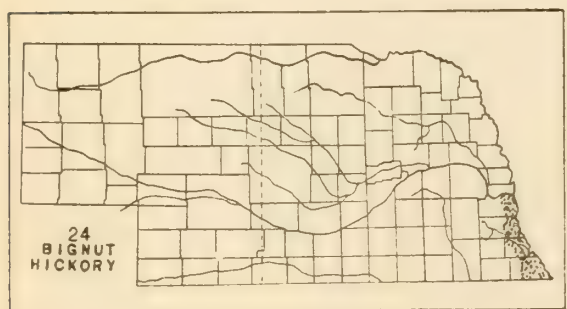
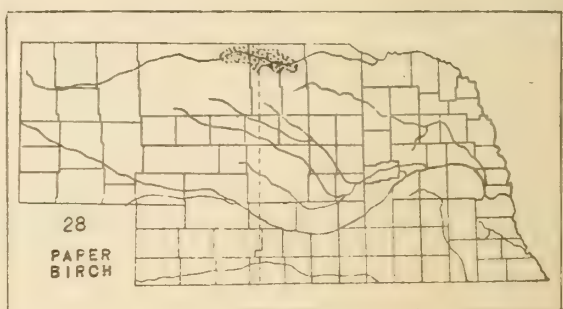
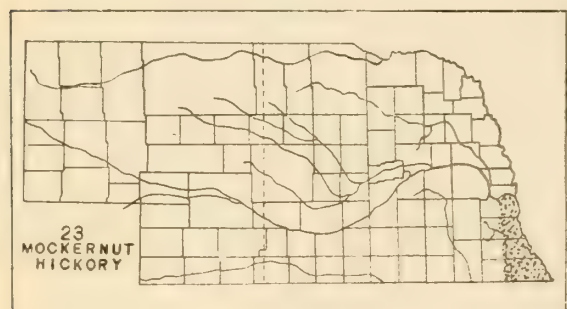
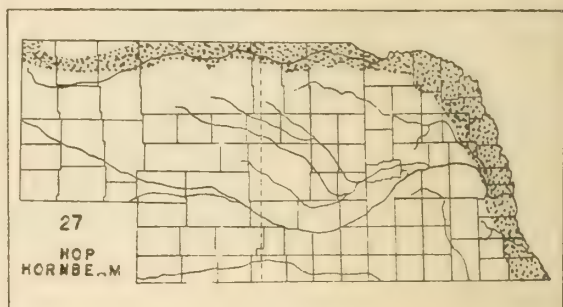
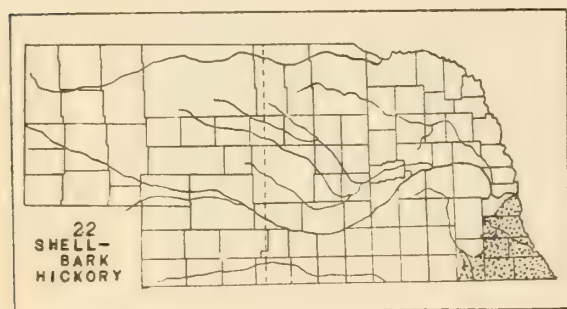
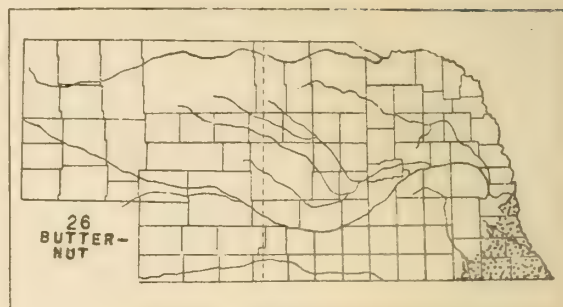
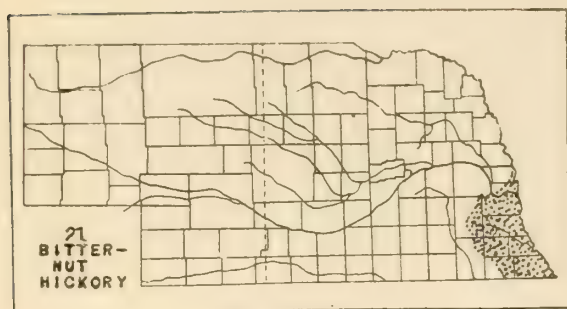
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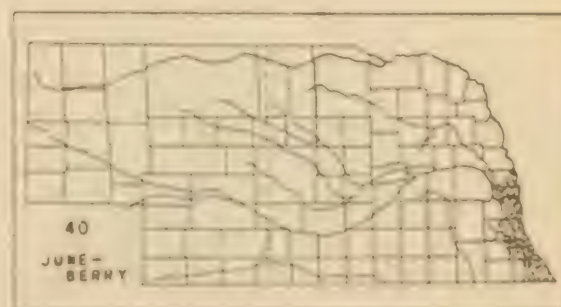
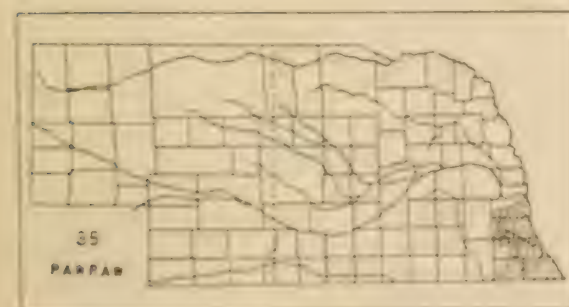
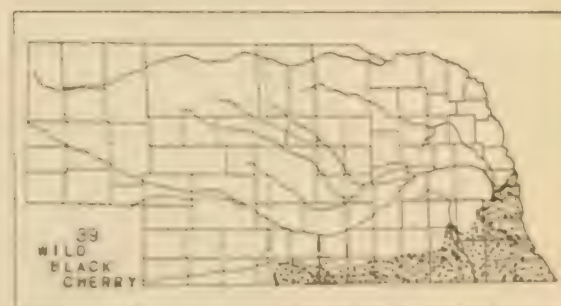
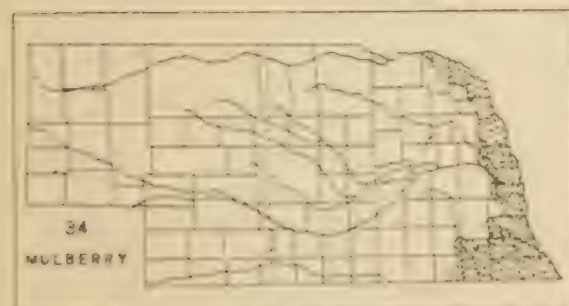
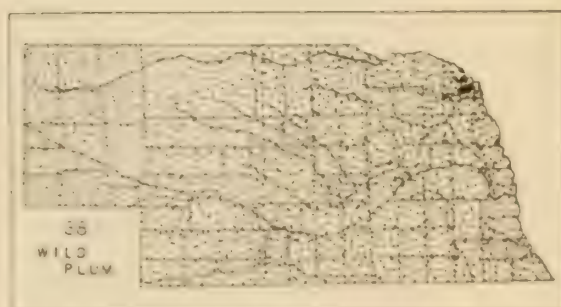
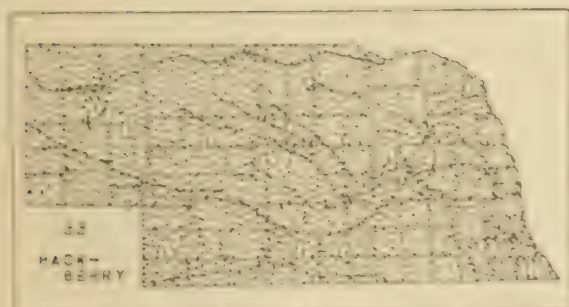
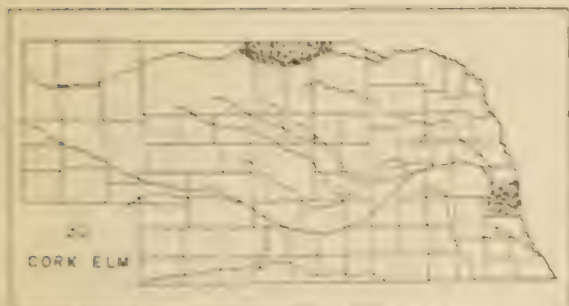
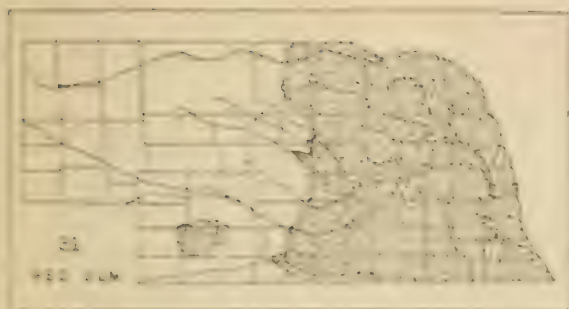
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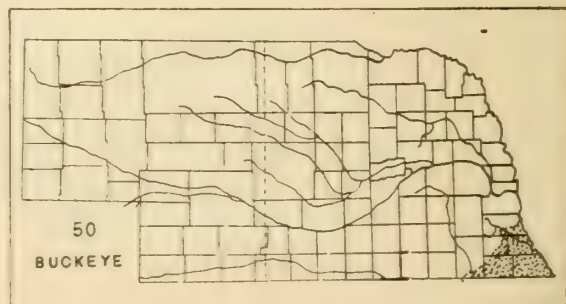
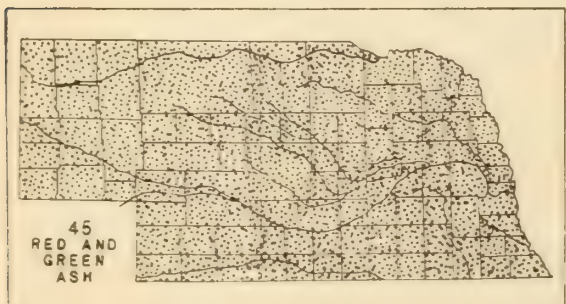
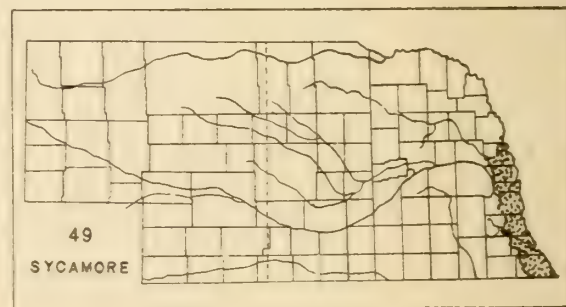
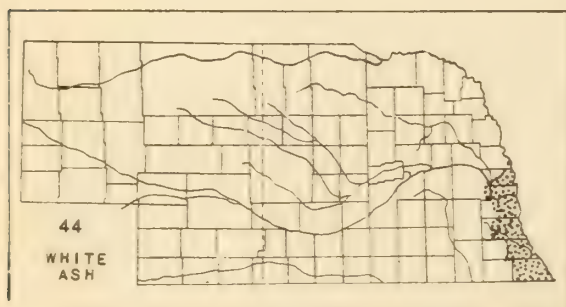
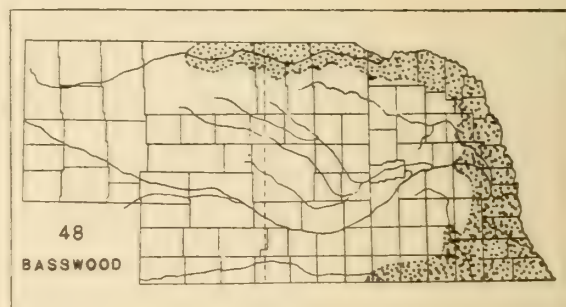
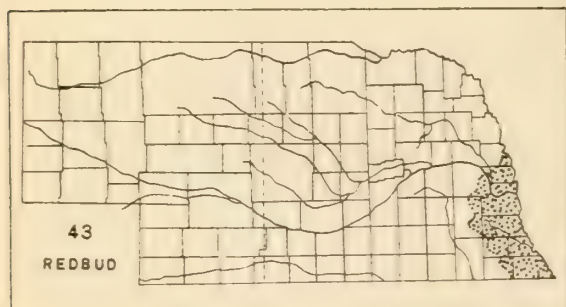
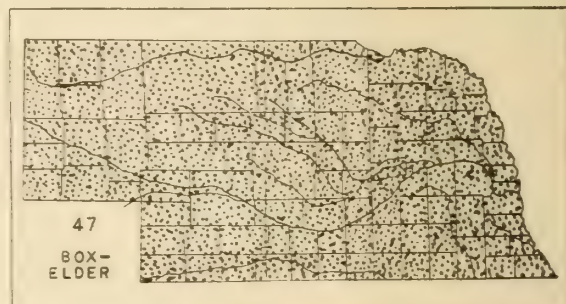
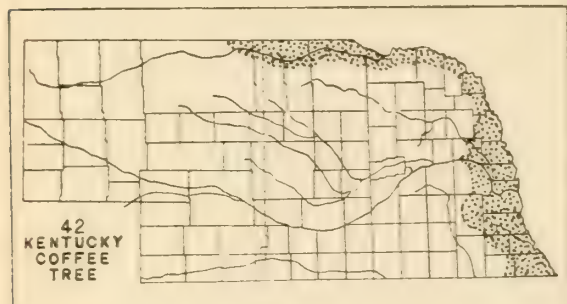
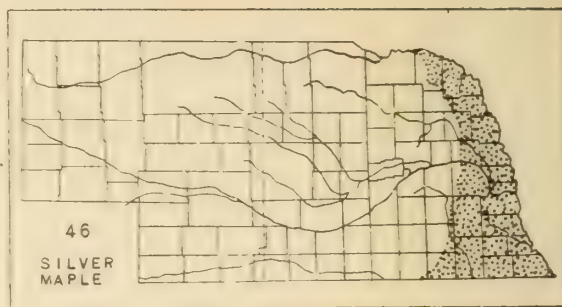
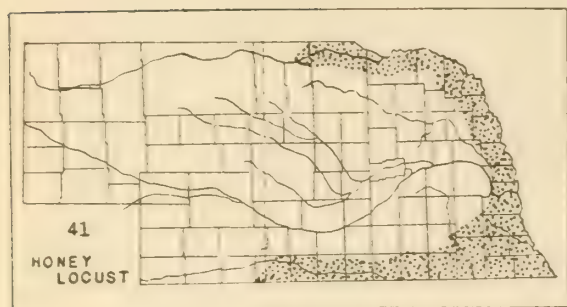
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